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Archaeological Investigations in the Southern Sierra Nevada: the Bear Mountain Segment of the Pacific Crest Trail

by

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cultural resources publications

archaeology

The cover figure depicts a basalt scraper from site CA-Tul-616 (KR-50, page 165).

ARCHAEOLOGICAL INVESTIGATIONS IN THE SOUTHERN SIERRA NEVADA: THE BEAR MOUNTAIN SEGMENT OF THE PACIFIC CREST TRAIL

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FOREWARD

This report represents the second contracted effort undertaken by the Bureau of Land Management, Bakersfield District, for the evaluation of cultural resource sites along the Pacific Crest Trail. The current study augments the first systematic archaeological investigations along the trail in the southern Sierra Nevada, completed in 1978 (Garfinkel et al, 1979). The researchers have extended our knowledge of the prehistory of the region more than 4000 years and present additional evidence of upland pinyon exploitation dating to 1200 B.C.

The Bureau of Land Management is pleased to publish this report and make available to scientists and laypersons an important contribution to the prehistory of the southern Sierra Nevada.

Eric Montizambert,
District Archaeologist,
Contracting Officer's
Authorized Representative

MANAGEMENT SUMMARY

The Bureau of Land Management proposes to complete construction of approximately 18 km of hiking trail in the southern Sierra Nevada to be incorporated into the Pacific Crest Trail. Intensive archaeological surveys conducted by the Bureau of Land Management along the Bear Mountail Segment of the Pacific Crest Trail disclosed 24 aboriginal sites and one historic site (Montizambert 1978). Fifteen of these sites were identified as likely to receive direct and/or indirect adverse impacts from trail construction and/or use.

Information obtained from the archaeological surveys of the Bear Mountain Segment does not appear to be sufficient to determine whether these sites meet the criteria for inclusion on the National Register of Historic Places. The Bureau of Land Management has concluded that a program of research and archaeological testing will be necessary in order to ascertain site significance for making Determinations of Eligibility to the National Register of Historic Places.

On September 18, 1978 the Bureau of Land Management awarded Kelly R. McGuire a contract totalling $60,376.00 to conduct a program of controlled surface collection, test excavation, and analysis of 15 aboriginal sites located along the Bear Mountain Segment. Fieldwork was conducted between September 20, 1978 and November 16, 1978. Analysis and manuscript preparation were undertaken between December 1, 1978 and September 30, 1979. All artifacts and records have been permanently curated at the Department of Anthropology, Bakersfield Community College, Bakersfield, California.

This research effort represents one of the first systematic archaeological testing programs in this region of the southern Sierra Nevada. Substantive research findings are presented that have broad ramifications to not only California archaeology/anthropology but Great Basin prehistory as well. These substantive research findings focus primarily upon: (1) the chronology of aboriginal occupation of upland pinyon areas of the southern Sierra Nevada, (2) the prehistoric subsistence-settlement practices employed by aboriginal populations within the study area, and (3) the prehistoric ethnolinguistic affiliation of sites located along the Bear Mountain Segment.

In addition to this demonstrated scientific significance the sites located along the Bear Mountain Segment also possess an ethnic value for present Native American peoples of the Kern Valley as well as a broad social significance for society as a whole. These considerations are outlined in the Management Recommendations contained within this manuscript.

While there appears to be no doubt concerning the significance and the need to protect the cultural resources contained along the Bear Mountain Segment of the Pacific Crest Trail, there is some uncertainty about the nature and intensity of potential adverse impacts upon subsurface cultural deposits resulting from trail use. A series of site monitoring procedures are recommended as a means to accurately assess the intensity and degree of disturbances resulting from trail use.

ABSTRACT

Archaeological investigations at 15 aboriginal sites located along the Bear Mountain Segment of the Pacific Crest Trail in the southern Sierra Nevada has revealed a settlement structure consisting of large pinyon base camps, temporary pinyon stations, and temporary hunting camps. This settlement structure, based primarily on the procurement of pinyon resources, appears to be of long standing, extending back approximately to the first millenium B.C. Prior to the development of pinyon exploitation, in a period extending from 4000 to 1200 B.C., this area may have been the locus of extremely sporadic hunting activity.

In addition, there is archaeological as well as linguistic evidence suggesting a relatively ancient differentiation between Tübatulabal and Numic Speakers in the vicinity of Walker Pass along the southern Sierra Nevada crest.

While there appears to be no doubt concerning the significance and the need to preserve the cultural resources contained along the Bear Mountain Segment, there is some uncertainty about the nature and intensity of potential adverse impacts upon subsurface deposits resulting from trail use. A series of site monitoring procedures are recommended as a means to accurately assess the intensity and degree of disturbances resulting from trail use.

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Several people including James West, Stephen Bass, Valerie Levulett, Stephen Andrews, Michael Bowers, Martin Baumhoff, Helen McCarthy, Sheila Mone, David Rhode, Tony Drake, Ron May, Richard Hughes, and Gayle Bacon provided assistance during analysis and manuscript preparation. Their contributions are gratefully acknowledged.

Much appreciated was the patient administration of this contract by Eric Montizambert and John Hunt of the Bureau of Land Management. Finally, a note of thanks to Kim McGuire and Bob Pfiel for their skillful bookkeeping.

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INTRODUCTION

The 15 archaeological sites comprising the Bear Mountain Segment of the Pacific Crest Trail are situated in the extreme southern Sierra Nevada approximately 20-25 km northeast of the town of Onyx and some 15 km southwest of Little Lake, Ca. (Map 1). Located in a predominately mountainous pinyon woodland, the trail segment runs in a general northwest direction between Lamont Meadow and Rockhouse Basin spanning an elevational transect from 1981 m to 2426 m (Map 2).

Within this region the crest of the southern Sierra Nevada forms a sharp environmental boundary that separates the well watered drainages of the Kern River with their dense stands of oak, pinyon, digger and jeffrey pine from the abrupt aridity and xeric plant communities of the western Mojave Desert. The Bear Mountain Segment is located a mere 4 to 10 km west of the Sierra Nevada crest.

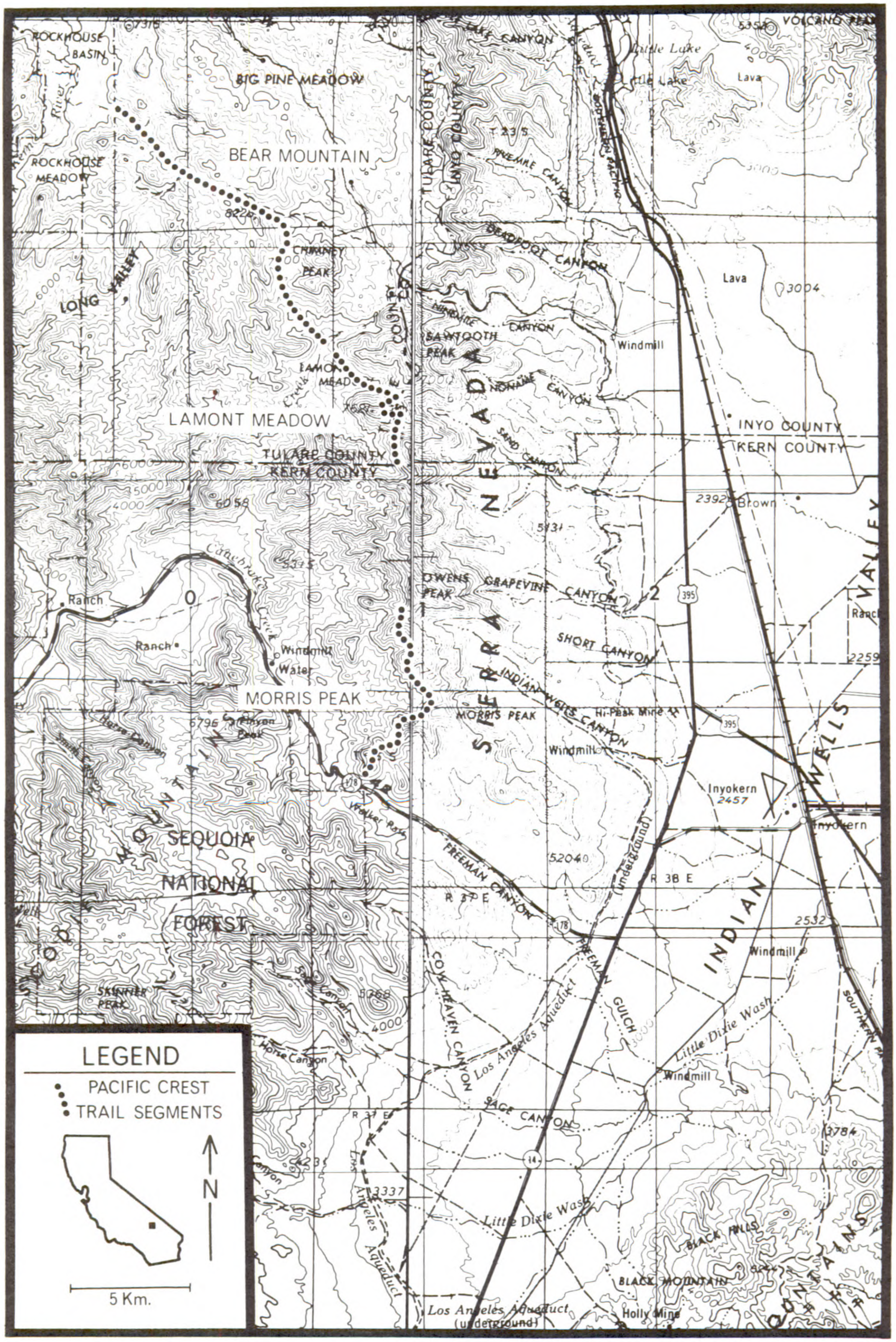
The Sierra Nevada crest also formed a general boundary between the subsistence-settlement pursuits of three aboriginal ethnolinguistic groups. These groups include: the Tübatulabal of the Kern River drainage, and the Little Lake Shoshone and Kawaiisu of the western Great Basin. While the Bear Mountain Segment lies in what has been identified as Tübatulabal territory, all the aforementioned groups made use of pinyon resources situated in the southern Sierra Nevada (Voegelin 1938, Zigmond 1938, Grosscup 1977).

Previous archaeological investigations within the Kern River drainage, until recently, have been limited to mostly unpublished small surveys and test excavations (c.f. Garfinkel _et al_ 1979). This situation contrasts markedly with the quantity of data reports, overviews, and articles concerning the prehistory of the western Great Basin and Owens Valley. Excellent summaries of this region are provided by Garfinkel (1975), Bettinger (1973, 1979), Hall and Barker (1975), E. L. Davis (1978), Busby, Findley, and Bard (1979).

The proposed construction of two discontinuous segments of the Pacific Crest Trail (Lamont Meadow and Morris Peak Segments, see Map 1) initiated the first comprehensive data recovery program of archaeological resources within this region of the southern Sierra Nevada. The results of this program are contained in _Archaeological Investigations Along the Pacific Crest Trail: The Lamont Meadow and Morris Peak Trail Segments of the Southern Sierra Nevada_ (Garfinkel _et al_. 1979).

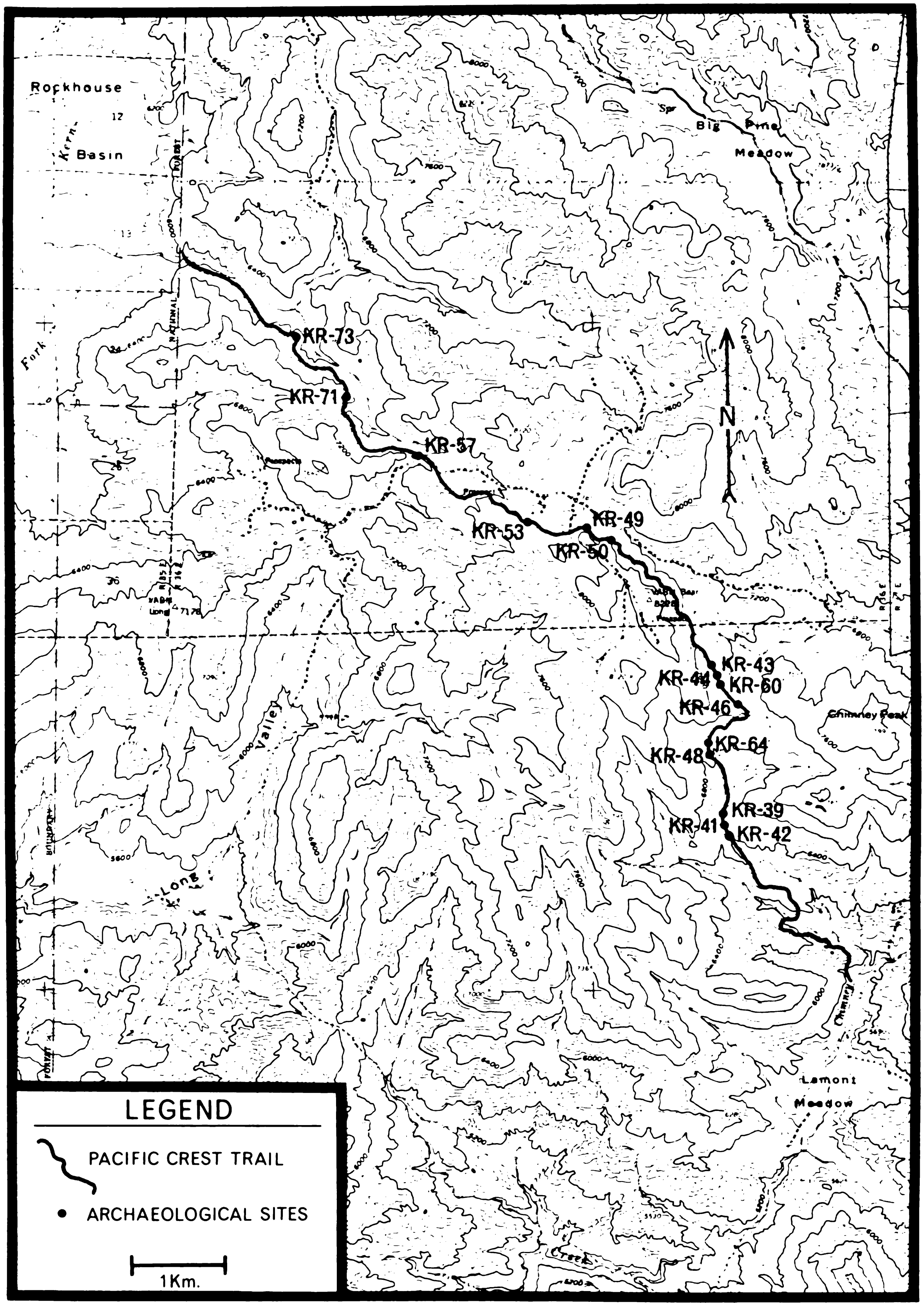
The results of this research indicate a 6000 year record of human use of upland pinyon areas of the southern Sierra Nevada. This prehistoric occupation focused on hunting and the systematic exploitation of pinyon resources, the latter appearing in more recent prehistoric periods (1000 B.C. - A.D. 1850).

The Bureau of Land Management (Bakersfield District) proposes to complete construction of approximately 18 km of hiking trail in the southern Sierra Nevada which will be incorporated into the Pacific Crest Trail. As a result of intensive archaeological surveys conducted by the Bureau of Land Management along the Bear Mountain Segment, 15 aboriginal sites were identified as likely to receive direct and/or indirect adverse impacts from trail use (Montizambert 1978). The surface cultural manifestations that characterize these sites range from small flaked stone



Map 1. Location of the research area.

Plate 1. Upland pinyon areas of the southern Sierra Nevada. View of Lamont Meadow (center of photograph) and the Sierra Nevada crest (mountain range on the horizon) from KR-41 on the Bear Mountain Segment.



Map 2. Location of sites along the Bear Mountain Segment.

scatters to large habitation areas possessing midden deposits and bedrock milling equipment.

On September 18, 1978 the Bureau of Land Management awarded Kelly R. McGuire a contract to conduct a program of controlled surface collection, test excavation, and analysis of the 15 aboriginal sites located along the Bear Mountain Segment.[1] Fieldwork was conducted by an eight-person crew between September 20, 1978 and November 16, 1978. Analysis and manuscript preparation were undertaken between December 1, 1978 and September 30, 1979. All artifacts and records have been permanently curated at the Department of Anthropology, Bakersfield Community College, Bakersfield, California.

[1] Site numbers indicated in this report are temporary project numbers designated by the Bureau of Land Management. Just prior to final submission of this report state trinomial site numbers were obtained. A cross-reference of temporary project site numbers and state trinomial designations are contained in Appendix 6.

ENVIRONMENTAL CONTEXT

by

David Rhode

General Setting

The Bear Mountain segment of the Pacific Crest Trail traverses the rugged mountain crest topography from Lamont Meadow to Rockhouse Basin, in the extreme southern Sierra Nevada, at 1800 to 2400 meters elevation (Map 2). The Sierra Nevada, a gigantic uplifted rib of batholithic granite, extends about 600 kilometers north from this area to Mt. Lassen, a continuous chain of peaks ranging from 1800 to over 4200 meters in elevation (Storer and Usinger 1963). Varying from 100 to 130 kilometers in width, it is a dominant feature of California geography, separating the California biotic province from the arid regions and continental influences to the east.

The Sierran block was uplifted to its present height beginning about 10 million years ago (Hill 1975), and is tilted westward, so that the western slope begins in valley foothills and steadily rises over most of the range's width to the crest. This gradual incline is dissected by a series of rivers which flow westward into the Central Valley. The Kern River, the upper reaches of which run through Rockhouse Basin, is the southernmost of these. The eastern Sierran scarp by contrast is precipitous, dropping sharply into the Mojave Desert. Unlike the western Sierra, few rivers crosscut this eastern scarp for two reasons. First, the watershed available to eastern streams is much smaller than on the western slopes due to the tilt. Second, most precipitation occurs in the form of snow from winter storms originating in the Pacific low pressure zone. These westerly storms leave a heavy deposit of snowfall on the western slope, but the lee side of the mountains receives considerably less due to the rainshadow effect.

The elevational and climatic variation of the Sierra results in a series of biological belts, or lifezones, which generally follow the Sierra in its north-south trend. Consequently, by following an east-west path across the Sierra from the Central Valley to the Mojave Desert, a biotic "cross-section" of these lifezones can be obtained. Figure 1 presents a cross-section from Bakersfield to Little Lake, and closely follows the Kern River drainage.

Three lifezones are represented along this transect. The first of these lifezones occurs in the San Joaquin Valley, and has been termed the Lower Sonoran Lifezone (Twisselmann 1967). This is the characteristic lifezone throughout the Central Valley and is typified in the southern end by extensive grassland vegetation with occassional stands of salt bush scrub. Climate is dry with hot summers and cool winters. The Bakersfield weather stations report an annual mean temperature of 18.4°C and an annual precipitation of 161 mm, 90 per cent of which occurs as winter rainfall from October through April (US Weather Bureau 1964). The Lower Sonoran Lifezone extends along the transect for 20 kilometers below 200 meters elevation. As the elevation increases, precipitation also increases at the rate of 94 mm per 100 meters up to the 300-meter elevation at the Kern River Powerhouse No. 1 (Major 1977).

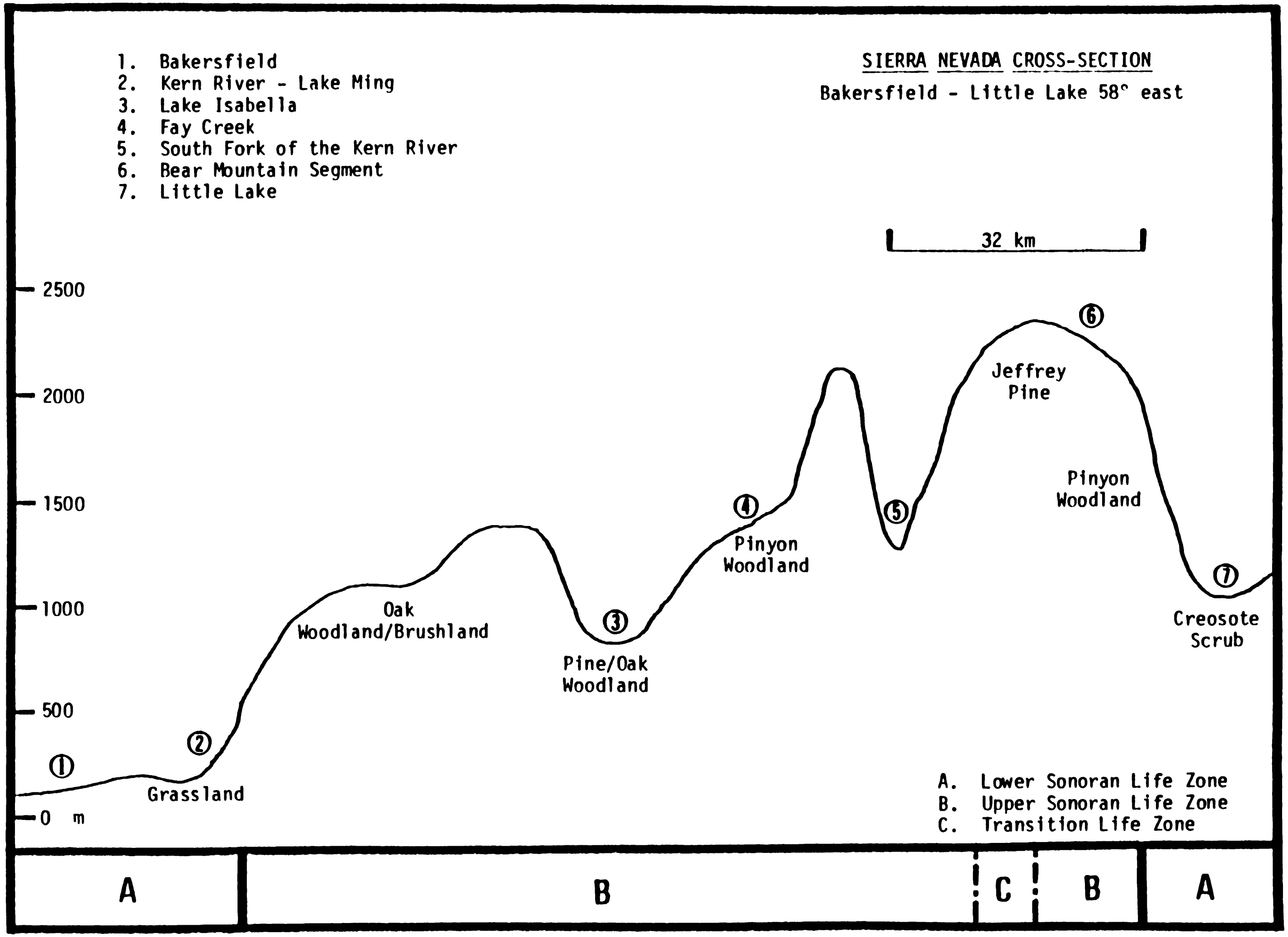


Figure 1. Lifezones and major plant communities of the southern Sierra Nevada.

This gives a precipitation of 272 mm at Lake Isabella. Temperature remains constant.

From about 200 meters elevation almost to the crest of the Sierra Nevada is the Upper Sonoran Lifezone which in the Kern River Canyon is characterized by pine-oak woodland and chaparral; higher in the mountains pinyon woodlands take over. Precipitation in the Upper Sonoran Lifezone ranges from about 300 to 400 mm annually though some stations report figures as low as 176 mm (Weldon) and as high as 1034 mm (Portuguese Meadows). This last figure from the upper Sierra is more typical of regions further north, and is excessive for most of the project area. Temperature drops slightly as elevation increases, with an annual estimate of 13.3°C for the Pacific Crest Trail.

At the crest of the Sierra Nevada in areas where precipitation is sufficient a third lifezone can be found. This is the Transition Zone, characterized by stands of Jeffrey pines. This zone is limited to small localities, however, here in the extreme southern Sierra Nevada. The limiting factor seems to be the pervasive aridity, and usually only those plants suited to a dry climate typical of the Upper Sonoran can dominate here.

Finally, as one continues east and descends the eastern scarp, the digger pine-oak woodland reappears, and on the desert floor the Lower Sonoran Lifezone is again reached. Here the vegetation is not grassland as in the Central Valley, but is the characteristic creosote bush scrub which dominates thousands of hectares of the Mojave Desert. The climate is warm and very dry. Data from Inyokern indicates an annual mean temperate of 17.6°C, similar to Bakersfield, though the seasonal and diurnal range is more extreme. Precipitation is a scant 73 mm annually.

The Bear Mountain Segment

The Bear Mountain Segment occupies an area within the Upper Sonoran Lifezone, and passes through several of the localized areas of Transition Zone. Several plant communities comprise the vegetation of the region, and numerous species of animals are found here (see Faunal Analysis chapter). Plants and animals found in the region are reported in Twisselmann (1967), Salt (1979), and Rhode (1979).

Previous work by the author (Rhode 1979) in the Lamont Meadow and Morris Peak segments of the Pacific Crest Trail adjacent to the present project area led to the establishment of four plant communities: moist meadow, dry meadow, coniferous forest, and desert sagebrush scrub.

Moist meadow. This community represents those plants associated with permanent sources of water. It is found in small valley areas and well-watered flats such as Lamont Meadow and extends along the margins of permanent streams. The community is characterized by a great diversity of plant and animal inhabitants. Dominant plant species vary. Willow (*Salix lemmonii*, *S. goodingii*), often growing in dense thickets, dominates along watercourses both in the flats and uplands. Wild rose (*Rosa woodsi*) and a sparse cover of herbs (*Achillea lanulosa*), *Mimulus guttatus*, and others) also grow here. Sedge (*Carex* sp.), yerba mansa (*Anemopsis californica*), and other herbaceous plants blanket boggy areas in valley meadows but are only sparsely represented in the uplands.

Few permanent streams and no true meadows exist along the Bear Mountain segment, and so this plant community is not well represented in the present archaeological study area. Many intermittent streams in the region also contain plants included in this community such as willow, wild rose, and various herbs.

Dry Meadow. Inhabiting sandy-bottomed valleys of alluvial wash, this scrub community is adapted to arid conditions. Sagebrush (Artemisia tridentata) and rabbitbrush (Chrysothamnus nauseosus) are dominant species, and occasionally occur in almost pure stands. A limited variety of other species, such as prickly poppy (Argemone munita), wild tobacco (Nicotiana attenuata), and paintbrush (Castilleja chromosa) are also found. Herbaceous understory is virtually non-existent. The plants of this community are characteristic of many disturbed areas in the southern Sierra and vicinity.

No representative stand of this community occurs in the present study area. It is found south of the project area in Lamont Meadow and also occurs at Chimney Meadow east of the Bear Mountain segment. Sagebrush and rabbitbrush are common throughout the region but not in this plant community.

Coniferous forest. By far the dominant plant community in the region, the coniferous forest covers virtually the entire study area. Pinyon pine (Pinus monophylla) is the most abundant arboreal species inhabiting both slopes and drainages of the region. Estimates of density range from 2 to 15 individuals per 100 m^2, or from 5 to 40 per cent cover. Digger pine (P. sabiniana) grows in the southern end of the Bear Mountain segment, and Jeffrey pine (P. jeffreyi) is localized in the northern portion; these are exclusively restricted to more moist drainages. Western juniper (Juniperus occidentalis) and canyon live oak (Quercus chrysolepis) can also be found in scattered localities, usually in rocky areas or on steep slopes below ridges. Numerous plant species make up the shrub layer of the coniferous forest. These include sagebrush, rabbitbrush, buckbrush (Rhamnus californica), flannelbush (Fremontodendron californica), coffeeberry (Ceanothus cuneatus), bitterbrush (Purshia tridentata), snowberry (Symphoricarpos parishii), and mormon tea (Ephedra viridis) among others. Shrub cover ranges from about 5 to 40 per cent throughout the coniferous forest. Generally tree cover has an inverse relationship to shrub cover: the greater the tree cover, the sparser the shrubs, and vice versa.

A great variety of herbaceous and semi-shrubby plants are also found in this community. Chief among these are needlegrass (Stipa speciosa), buckwheat (Eriogonum sp.), beavertail cactus (Opuntia basilaris), and bird's beak (Cordylanthus compactus). Some of these, as with shrubs, have widespread distribution giving an impression of low diversity for the coniferous forest. This impression is somewhat misleading on a regional level for many plants are restricted to small localities. The coniferous forest community is the most diverse as well as the largest plant community in the uplands of the extreme southern Sierra Nevada.

Desert sagebrush scrub. This fourth designation originally described that plant community found along the eastern scarp of the Sierra Nevada which overlooks the Mojave Desert. It is characterized by an abundance of plants of desert origin (principally sagebrush and bitterbrush) and a shrubby aspect. In the present study area an analogous community exists occurring in scattered patches throughout the upland xeric areas of the Bear Mountain segment. It is very similar in composition to the coniferous

foreest community, but the arboreal species are lacking. Desert influence is not so pronounced in this particular area. A greater frequency of shrubs (such as snowberry and buckthorn) and grasses are found in this community, in comparison with the coniferous forest.

Disturbed areas. Extensive areas of former pinyon woodlands in the present study area have been chained for range improvement, introducing the problem of vegetational disturbance. Numerous roads wind through the area too, allowing plants well adapted to disturbed soil conditions to populate and often dominate areas previously unoccupied by them. Such plants as rabbitbrush and bromegrass (Bromus sp.) would not be as frequent as they are had not man-induced disturbance occurred. Thus, while most of the region is rather pristine, the native vegetation for some areas has been significantly altered. This is true of several of the archaeological sites discussed in this report, and this will affect any attempts at postulating the functional or economic placement of these sites within the environmental framework presented above.

The Sites

All archaeological sites along the Bear Mountain segment (with the exception of KR-53) are found within the pinyon woodlands of the coniferous forest community. The species composition of these woodlands varies from site to site, and reflects varying elevation, soil type, topography, proximity to water, and other factors. In some cases, species composition reflects the presence of other communities nearby. For example, site KR-53 is located in a small sagebrush-scrub flat surrounded by coniferous forest. Several sites, such as KR-39, 41, and 42 are located in the coniferous forest but intermittent drainages, and water-associated plants are found nearby.

The environmental setting of each archaeological site was determined using a "point-space" method of analysis: vegetation within the general boundaries of the sites was recorded. A complete list of plants was obtained for each spaital point represented by a site. Estimates of density and cover of principal plant species were also developed. Plants were identified using Munz and Keck (1963), Twisselmann (1967), and Jaeger (1941). Fieldwork was conducted in late April, 1979, by the author and Mrs. Zora Parkevitch-Tammer. Mrs. Parkevitch-Tammer also recorded plants growing during late summer and fall on the sites, with the result that we now have observations for the full flowering season in this region. Table 1 summarizes the floristic data from each site. Note that the sites are arranged in the order of their location on the trail, south to north, so that a floristic and elevational cross section of the region takes shape. Symbols in the table represent the following:

x .... present on site
o .... present offsite, nearby
CF .... coniferous forest community
R .... moist meadow (riparian) community
S .... sagebrush scrub community

Communities in parentheses indicate their presence near the site.

Table 1

Plants Observed on Sites Located Along the Bear Mountain Segment

	KR-42	KR-41	KR-39	KR-48	KR-64	KR-46	KR-60	KR-44	KR-43	KR-50	KR-49	KR-53	KR-57	KR-71	KR-73
ELEVATION (m)	1981	2000	2000	2097	2110	2195	2225	2234	2243	2414	2426	2377	2195	2097	1975
PLANT COMMUNITY	CF(R)	CF(R)	CF(R)	CF	CF	CF	CF	CF	CF	CF	CF(S)	S(CF)	CF	CF	CF
Pinus monophylla	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
Juniperus occidentalis	o	o	o	x	x		x	x		x		x	x	x	x
Pinus sabiniana	x	o	o												
Salix lemmonii	o														
Quercus vaccinifolia	o														
Quercus chrysolepis				o	o	o		o	x						x
Cercocarpus ledifolius													x		
Pinus jeffreyi															x
Artemisia tridentata	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
Ephedra viridis	x	x				x				x			x		x
Chrysothamnus nauseosus	x	x	x									x			
Fremontodendron californica						x	x	x	x			x			
Purshia tridentata						x	x	x			x	x			
Ribes cereum				x	x	x	x	x		x			x		
Ceanothus cuneatus							x						x	x	
Lupinus albifrans											x				x
Tetradymia canescens												x			
Symphoricarpos parishii											x				
Rhamnus californica	o														
Stipa speciosa	x	x	x	x	x	x	x	x	x				x	x	x
Cordylanthus compactus	x	x	x	x	x		x						x	x	x
Opuntia basilaris	o			x	x		x	x	x	x			x	x	x
Eriogonum sp.				x	x		x	x	x				x		
Allium campanulatum										x	x	x			
Salvia dorrii											x				
Vicia sp.												x			
Lomatium mohavense											x		x		
Delphinium sp.													x		
Calochortus sp.													x		
Monardella exilis				x	x	x	x	x							
Castilleja chromosa													x		
Linanthus sp.															x
Mimulus whitneyi															x
Achillea lanulosa	o												o		
Perideridia bolanderi	o														
Epilobium paniculatum	o														
Cruciferae															x
Compositae				x	x	x	x					x			
Gaminae				x										x	

Results

Analysis of these data reveals several trends in the vegetational ecology of the region, but also a marked overall homogeneity. Expectably, the Sirran floristic regime influences the northern sites more than those further south. This is manifested primarily by the Jeffrey pines, and small herbaceous species such as Mimulus. Several species are limited to drainage areas, and are represented only around sites near these drainages; digger pines, huckleberry oak, and herbs such as willow-herb (Epilobium paniculatum) and Yarrow (Achillea lanulosa) comprise this set. Many plants noted in the sites show elevational restrictions. Needlegrass and bird's beak, for example, appear not to grow above 2300 meters elevation whereas wild onion (Allium campanulatum) is not found below that. Snowberry and Bitterbrush are residents of higher elevations, while coffeeberry and buckbrush occupy low-elevation sites. Vegetational differences among sites are summarized below:

KR-39,-41, and-42 are situated near an intermittent stream, and several riparian species (e.g. willow and wild rose) are found here. Pinyon stands are moderate at these sites, having about 30 per cent cover which is slightly higher than the regional mean (23 per cent). Rabbitbrush grows abundantly on sites 39 and 41 almost to the point of eliminating sagebrush from the sites. The source of this local abundance is the heavy disturbance which occurred here.

KR-48,-64,-46,-60,-44 and-43 are a string of sites located at about 2200 meters elevation on the east-facing slope of a long ridge usually near rock outcrops. Juniper, flannelbush, and gooseberry (Ribes cereum) are present here. Pinyon cover ranges from 15 to 25 per cent at these sites. Occasional stands of oak grow on the rock outcrops nearby.

KR-49,-50, and-53, the high-elevation sites, are dominated by either dense stands of pinyon (40 per cent cover) or dense shrub cover. Several species not occurring elsewhere are found here: snowberry, wild onion, thistle, sage (Salvia dorrii), and others.

KR-57, a large site strung out along a secondary ridge, contains the greatest diversity of plants of any site in the study area. Pinyon density is variable but averages 30 per cent cover. The site is totally within the coniferous forest community, and the range of plants shows the variation that a single point can attain in this one community.

KR-71 and-73, the most northerly sites, are the most Sierran in floristic composition. Pinyon cover averages 15 per cent, and juniper cover is about 5 per cent.

In general, the region encompassing these sites is quite homogeneous. Most dominant species are dominant throughout, essentially exhibiting variation in density and cover. The amount of vegetation at each site varies with a suite of conditions: elevation, slope aspect, soil type, amount of rock, amount of moisture present, snowfall, historical factors such as the age of stand, and so on. This is true especially for pinyon. The density of the pinyon stand in turn exerts an effect upon the density of sagebrush (negatively, presumably through competition) and needlegrass (positively, presumably by protection from snowfall and sun). This variation is a dynamic component of an essentially uniform plant community.

Prehistoric Subsistence Value of the Bear Mountain Segment

Many plants were of use to the aboriginal inhabitants of the area, but the principal subsistence staple of the upper elevations of the southern Sierra was the abundant pinyon crop (Voegelin 1938; Steward 1938; Zigmond 1941). The pinyon forests of this region supplied enough food (in the form of seeds) that several groups in the vicinity, notably the Tübatulabal, Kawaiisu, and Lattle Lake Shoshone, considered pinyon nuts a dietary staple, and made annual treks during the autumn to collect and store them. Pinyon was not, of course, the only plant of value in the area. Rhode (1979) summarizes the ethnobotanical knowledge for the region, and a brief synopsis will be included here. Useful plants will be treated as two groups: those plants prized for their food value and those used for other activities.

Food Plants

The abundant nut crops were the primary vegetal food source in the area, pinyon nuts chief among these. Digger pine nuts and possibly acorns were collected in the area. These were gathered during early fall. The Bear Mountain Segment passes through the major collecting grounds of the pinyon for the Tübatulabal (Voegelin 1938) while digger pine nuts and acorns were available in greater abundance in Kern River Canyon and the surrounding foothills.

Numerous fruits and berries were available in the area to augment the staple foods. Juniper "berries," rose hips, beavertail cactus pads and pods, gooseberries and possibly buckthorn berries are all known foodstuffs available in the area. These were generally available during the summer months; rose hips were consumed in the autumn.

Seeds of buckwheat, grasses, sage, and composite were also available during summer. Assorted greens, such as the tops and leaves of wild onion, the shoots of buckwheat, leaves and stems of *Monardella exilis*, and young leaves of thistle (*Cirsium* sp.) were available during spring. Bulbs of mariposa lily (*Calochortus* sp.) were also collected at this time. Many of these plants are more abundant elsewhere, and whether they were utilized as food in the upland areas of the Sierra Nevada is subject to question.

Non-Food Plants

Fuel was an important secondary role plants played for prehistoric populations. Charcoal remains from the archaeological sites located along the Bear Mountain Segment demonstrate the use of sagebrush, pinyon and digger pine, rabbitbrush, juniper and oak as firewood. Wood from juniper was used to make bows, stirring paddles, and other implements. Fiber for twine, nets, and other things was taken from sagebrush, juniper, and flannelbush. The withes of willow were gathered in the spring and contributed to the making of baskets, snares, and other utility items. Grass was also employed in basketmaking. Brush shelters were formed using a frame of willow or oak poles, covered with rabbitbrush. Rabbitbrush was also used as chewing gun and medicinal tea. Mormon tea was used for medicine and for refreshment.

Discussion

That the collection of pinyon nuts during the autumn was the principal economic activity represented by the archaeological sites in this area appears undisputed; both the archaeological evidence and firm ethnographic data point to this conclusion.

Pinyon woodland exists as uniform vegetative blanket over almost the entire study area. With such little distributional variability in this most important of food crops, coupled with only a minimal economic reliance on other plant resources occurring within pinyon woodlands, it would appear doubtful that the vegetational environment played a major role in the selection of settlement location.

The author believes that settlement determinants were based more on variables other than local vegetation. For instance, large pinyon basecamps (see Prehistoric Land Use Patterns section) appear to be most often found in relatively flat areas, at lower elevations, next to a permanent water source. In these cases, the need for water, habitation space, as well as the ability to avoid late fall snows for as long as possible, appear to be the primary considerations involved in settlement location. Temporary pinyon stations and temporary hunting camps are generally located on spurs and ridges that provide small flat camping and lookout areas in an otherwise steep and rugged mountain terrain.

In summary, the extreme southern Sierra Nevada area is a region of overall homogeneity and localized diversity of biota. This fact supports the interpretation of a single economic vegetational unit in aboriginal times, one which centered on the collection of pinyon. Specific settlement determinants varied with site function, but relied largely on geomorphic features such as proximity to water, slope aspect, and elevation, and was conditioned to a lesser extent by vegetation.

ETHNOGRAPHY

The southern Sierra Nevada and western Mojave comprise a region which was occupied by at least three ethnolinguistic groups; these include the Tübatulabal, the Kawaiisu, and the Little Lake Shoshone. Although the fifteen archaeological sites located along the Bear Mountain segment lie within the ethnographic territory of the Tübatulabal, other groups may have frequented the area for food gathering purposes, as food areas were not owned by particular grousp and free use was common (Voegelin 1938; Cappannari 1950). Archaeological investigation of these sites may suggest the extent to which groups other than the Tübatulabal used the area.

Of chief importance in this section will be the examination of land-use patterns, social organization, and trading relations for the three previously identified ethnolinguistic groups. A summary of the available ethnographic information for these groups follows.

Ethnolinguistic Groups

The study area lies at the interface of three different ethnolinguistic groups: Tübatulabal, Kawaiisu, and Little Lake Shoshone (Map 3). Ethnographic description of the Tübatulabal is most fully treated in the comprehensive work of Erminie Voegelin (1938). Information on the aboriginal lifeways of the Kawaiisu is unsystematic and scattered in a number of papers. Most ethnographic fieldwork has been conducted by Maurice Zigmond (1938, 1941, 1972) and Stephen Cappannari (1950), but as yet no full length ethnographic work on this group has been published. Zigmond is actively publishing papers on various aspects of Kawaiisu culture and a summary treatment of the culture will appear in the forthcoming Smithsonian's volume on the Great Basin in the new Handbook of the Indians of North America. The Little Lake Shoshone, also called Koso or Panamint Shoshone, are only modestly treated within ethnographic accounts on Great Basin peoples. Most material is found in Julian Steward's definitive volume, Basin-Plateau Aboriginal Sociopolitical Groups (1938: 70-93). Other pertinent data on the Panamint Shoshone is found in Coville (1892), Dutcher (1893) and Grosscup (1977). The following ethnographic summaries will be based on these previously cited works.

Linguistics

The languages spoken by these three difference peoples fall into two broad linguistic groups: Numic and Tübatulabalic. The Numic languages comprise the most northern branch of the Uto-Aztecan linguistic stock. Numic languages are distributed throughout the Great Basin in a large triangular area whose apex lies in the southern Sierra Nevada and whose base lies along the Rocky Mountain chain (see Fowler 1972:106 for a general map). Kawaiisu and Little Lake/Panamint Shoshone belong to the southern and central divisions of Numic respectively. The language group Tübatulabalic contains but a single language, Tübatulabal. This language has been suggested to be vefy similar to the Numic group (Hale 1958-1959).

Linguists have noted that the Numic languages are all very closely related and this is considered to be indicative of their very recent spread across the Great Basin (Lamb 1958; Miller, Tanner, and Foley 1971). Glottochronological studies suggest that the present distribution of Numic languages dates to about 1000 years ago (Hale 1958-1959). Further information indicates a minimum period of divergence for Numic and Tübatulabal of approximately 2500 to 3000 years (Hale 1958-1959, Lamb 1958).

Territorial Boundaries

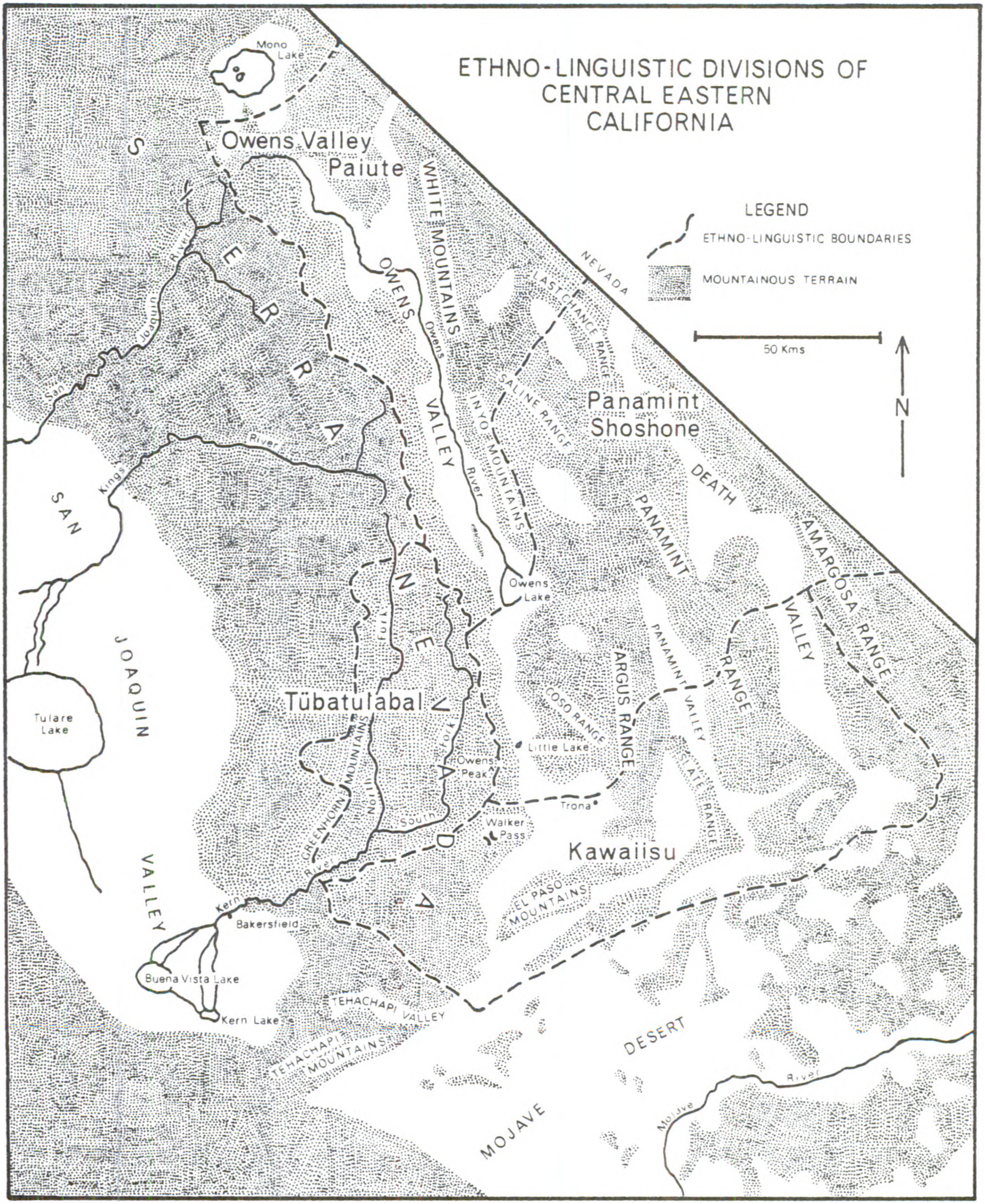
Ethnographic data on the territorial boundaries for these three groups have until recently been ill-defined. A recent analysis of published references and the unpublished notes of C. Hart Merriam (Grosscup 1977) has led to the clarification of the ethnolinguistic boundaries of these three groups.

There has been little disagreement as to the general territory of the Tübatulabal. Their territory has been determined to include the region which was naturally drained by the Kern River including the area from the river's source near Mt. Whitney to the end of Kern Canyon northeast of Bakersfield (Voegelin 1938:9). The eastern boundary runs along the Sierra Nevada crest south to Walker Pass and then along the crests of the Kiavah and Paiute Mountains southwest to the San Joaquin Valley.

There has been some question concerning the Tübatulabal-Kawaiisu border. The Kawaiisu occupied a territory which included the southern end of the Sierra Nevada range and extended westward toward the San Joaquin Valley and eastward into the Mojave Desert (Kroeber 1925). These tribal borders are vague and difficult to delineate.

Steward (1938:71) indicates that the Kawaiisu also occupied certain desert areas: the southern end of the Panamint Valley, the Argus Mountains, and the area in the vicinity of Trona. Of importance is the fact that Steward's Kawaiisu informant resided in Grapevine Canyon in the Sierra Nevada within the general study area. Steward (1938:71) suggested that the Tübatulabal adjoined the Kawaiisu to the south but occupied a portion of the Mojave Desert west of the Kawaiisu. Steward also stated that the Tübatulabal had once owned the Coso obsidian quarry which is usually considered to be within Little Lake Shoshone territory. Zigmond (1938) suggested that the northernmost boundary of the Kawaiisu extended to an area just south of Owen's Peak and north of Walker Pass; this is contrary to Voegelin's (1938:7) statement that the Tübatulabal controlled Walker Pass and areas to the north. Grosscup (1977) reconciles these differences using information from Merriam's notes. He indicates that the Tübatulabal's eastern border was most likely the crest of the Sierra Nevada and that a part of Walker Pass west of the crest of the Sierra Nevada, near Canebrake Creek but not the pass itself, was mutually occupied by the Panamint Shoshone and the Kawaiisu. Zigmond's data (1938) indicate that the Kawaiisu alone controlled the pass.

The territory of the Panamint Shoshone was a portion of the western Great Basin extending from the Sierra Nevada on the west to the Armagosa desert of Nevada on the east and from Owens Valley southward to an area in the south most likely shared with the Kawaiisu and other Southern Paiute groups (Grosscup 1977).


ETHNO-LINGUISTIC DIVISIONS OF CENTRAL EASTERN CALIFORNIA
LEGEND
ETHNO-LINGUISTIC BOUNDARIES
MOUNTAINOUS TERRAIN
50 Kms
N
Mono Lake
Owens Valley Paiute
Panamint Shoshone
Tübatulabal
Kawaiisu
SIERRA NEVADA
WHITE MOUNTAINS
OWENS VALLEY
Owens River
INYO MOUNTAINS
SALINE RANGE
LAST CHANCE RANGE
NEVADA
DEATH VALLEY
PANAMINT RANGE
PANAMINT VALLEY
AMARGOSA RANGE
ARGUS RANGE
COSO RANGE
SLATE RANGE
Owens Lake
Little Lake
Owens Peak
Trona
Walker Pass
EL PASO MOUNTAINS
San Joaquin River
Kings River
SAN JOAQUIN VALLEY
Tulare Lake
North Fork
South Fork
GREENHORN MOUNTAINS
Kern River
Bakersfield
Buena Vista Lake
Kern Lake
TEHACHAPI VALLEY
TEHACHAPI MOUNTAINS
MOJAVE DESERT
Mojave River

Map 3

Land-use, Social Organization, and Trading

The subsistence-settlement practices, social organization, and trading relations for these three ethnolinguistic groups will be detailed next. The Tübatulabal's aboriginal lifeway as previously mentioned, is most fully described. Tübatulabal lived in an area of varied topography and vegetation which contained both typically Sierran and Great Basin flora. Due to this condition an abundance of resources was easily available. This abundant resource base allowed the Tübatulabal to maintain a substantial population (approximately 1000 persons) and relatively permanent village sites. These hamlets located along the reaches of the south fork of the Kern River were occupied through the winter, early spring, and intermittently at various other times of the year.

From February to mid-August, food gathering activities for the Tübatulabal were focused near their hamlets. These activities included bulb gathering, fishing, hunting for deer, small game, and waterfowl, gathering seeds, greens, and juniper berries and harvesting digger pine nuts. During this period use was made of resources available in the valleys, foothills and river canyons 600 to 1200 meters in elevation. In August and continuing through the middle of November families moved into higher elevations (1500 to 1800 m). In the late fall movement was oriented toward the use of pinyon resources on the western slopes of the Sierra Nevada. Later, movement was timed to coincide with the ripening of acorns in the Greenhorn Mountains. During the winter (mid-November to February) groups returned to the valley-foothill region and to their hamlets along the south fork of the Kern River.

The subsistence activity of most importance to this study is that of the pinyon harvest. Pinyon collecting for the Tübatulabal began in mid-August in the lower elevations of the pinyon area. In this area juniper berries were gathered, fish caught, small game trapped, and deer and birds hunted. In higher elevations from September to mid-October pinyon nuts were gathered and cached. Some hunting of deer and small game was also conducted. A hierarchical structure of pinyon settlement types are indicated ethnographically: first, a large camp which included a corral-like enclosure of brush which housed a number of families and their supplies; and second, a more temporary pinyon "station" which contained a shelter composed of poles and brush used by a single family.

Pinyon was harvested when the cones reached maturity but were still green and unopened. When buckbrush (Rhamnus californica) berries were ripe people would move to the mountains to gather pinyon nuts. Men would first go out to find which areas were good. Then all inhabitants of a hamlet or several hamlets would make the excursion to these areas.

Men and boys first knocked the cones from the trees with long poles. Men and women picked up the cones, placed them in conical lug baskets, and, in turn, emptied them into larger pack baskets. At the pinyon camp, when enough cones had been gathered, a bed of sage (Artemisia tridentata) was prepared. The cones were dumped on the sage and the bed set on fire. The intense heat from the fire caused the cones to dry out and the cone scales to open. The cones were examined from time to time to insure that they were sufficiently open. If the brush burned down and the cones were still unopened, more brush was added, and the roasting continued. When the cones were fully open and allowed to cool, nuts were shaken out, picked out by hand, or winnowed from the dirt. The nuts were then spread

on hides to dry for a period of three or four days. Excess nuts were cached in pits. These pinyon caches consisted of circular pits five feet in diameter and two and a half feet deep dug into natural "rock shelters" and lined with flat rocks or brush. Pinyons were dumped into the cavity and covered with large flat rocks or grass and small stones. In winter men made trips to these caches to secure pinyon and packed their store home in skin sacks.

Pinyon nuts could be prepared in a number of ways. Previously roasted nuts were cracked by heaping them on a grinding stone and gently crushing them with a mano using a sort of rotary motion. The nuts could then be shelled and cooked in a clay pot. Shelled nut meats could also be pounded into meal in a portable or bedrock mortar.

The social organization of the Tübatulabal was substantially more complex than the other two groups inhabiting the general study area and distinctly more Californian in type. An informal council of old men united the various hamlets and had the responsibility for choosing a Tübatulabal chief. Neither of these political units were sharply defined or institutionalized. The chief was simply a man who was either matrilineally or patrilineally related to the former chief (although the lineage principle was unrecognized), possessed some wealth, was of middle age, and had a "good heart". The office entailed the responsibilities of arbiter and gave him a degree of prestige among his fellows. The position of chief was a lifetime appointment.

Judicial responsibilities included the resolution of conflicts concerning women, family affairs, and the overseeing of collective gatherings. At the gatherings, the chief insured that all individuals contributed a fair share to the proceedings. The chief was also somewhat of an orator delivering uplifting lectures to the public.

The clown/dance manager, whose role was farcical rather than serious, counterbalanced the authority of the chief by publicly expressing discontent if the chief was an unsatisfactory leader. In this manner the clown/dance manager would instigate the selection of a new chief. The duties of the clown dance manager also included the supervision of the annual mourning ceremony and dance. The office was patrilineally inherited.

There was no ownership of resource areas among the Tübatulabal. Non-Tübatulabal peoples could and did use resources within their territory without special permission. Trading relations with other groups were good. Exchanges took place with the Chumash, Yokuts, Northfork Mono, Kawaiisu, and probably the Owens Valley Paiute and Panamint Shoshone. Intermarriage with other groups also took place and was documented for the Palegewan, Bankalachi, Owens Valley Paiute, Kawaiisu, Panamint Shoshone, Yokuts, and Chumash.

Subsistence-settlement practices for the Kawaiisu are difficult to determine. The sketchy ethnographic accounts, alluded to in the introductory statements of this section, suggest that the Kawaiisu wintered in the Tehachapi Mountains occupying hamlets consisting of two to six houses. During the spring it is known that seeds from certain annuals and grasses were gathered including, Indian Rice Grass (Oryzopsis hymenoides), Tick Seed (Coreopsis bigelovii), blazing stars (Mentzelia spp.), Tansy Mustard (Descurania pinnata), and chia (Salvia columbariae and Salvia carduacea). Summer was a time of considerable movement and fall was spent in the higher mountains gathering acorns and pinyon nuts. Fishing was conducted, although few good fish streams were found within Kawaiisu territory, and rabbits were hunted communally.

Social organization of the Kawaiisu was similar in some aspects to that of the Tübatulabal. Chieftainship was associated with the possession of personal wealth. The chief had no coercive authority but supervised feasts and bore much of the expense for these occasions. No published information is available for the marriage practices of the Kawaiisu.

Trading activities were conducted by direct barter or through the use of shell bead money with the Yokuts, Tübatulabal, Panamint Shoshone, and Owens Valley Paiute.

Lastly, ethnographic information for the Panamint Shoshone will be summarized. The subsistence-settlement practices of a segment of the Panamint Shoshone, the Little Lake Shoshone or the Kuhwiji district of the Shoshone, is the most pertinent to this discussion. The Kuhwiji district was made up of four loosely interrelated villages. These were located at Little Lake, Olancha, Coso Hot Springs, and near Darwin.

Unlike the semi-sedentary Tübatulabal, the Little Lake Shoshone were a more sparse and scattered population adapted to the marginal resource base of the western Great Basin. Economic life was centered around individual families with little more complex socio-political structures. Individual families would practice a seasonal pattern of transhumance timed to the differential availability of various plant and animal sources.

All available information for subsistence settlement practices in the Kuhwiji district comes from an informant from the village at Coso Hot Springs. Because the Coso village is somewhat east of the study area, it is uncertain whether the informant's comments pertain to land use practices nearer the Sierra Nevada Crest. The seasonal round for the Little Lake Shoshone was not completely routinized, so it seems likely that the resources of the southern Sierra Nevada, especially the productive and easily accessible pinyon groves, would have been exploited from time to time (Garfinkel et al. 1979).

In the spring, greens and seeds were gathered, and sometimes antelope were communally hunted. In midsummer families might travel to Saline Valley or Death Valley to gather mesquite. From July through September, plant foods were gathered in the Coso Mountains.

By September and October the Shoshone would move into pinyon areas of the Coso and Panamint Mountains. Subsistence-settlement structure within pinyon areas appears to be somewhat less elaborate than the hierarchical settlement structure exhibited by the Tübatulabal. Simple temporary camps were established near the ecotone between the pinyon woodland and sage communities (Dutcher 1893). Several windbreaks were constructed at these temporary camps which housed several families.

Nuts were collected by women using poles to knock the cones from the trees. The cones were then collected in large conical baskets and transported to camp. In camp, nuts were removed from the cones by placing the cones on a large slow-burning brush fire (Dutcher 1893). The cone scales would then open exposing the nuts.

After the harvest some of the nuts were transported down to the winter villages, the remaining nuts were cached in the mountains.

Winter villages were generally located on streams in the low valleys. These villages consisted of several families whose subsistence was greatly dependent on stored foodstuffs of which pinyon nuts was the major constituent, although meat from rabbits was a significant addition to the diet. Ducks were hunted at Owens Lake in the fall, and rabbit drives were also

conducted at this time. Additionally, bighorn sheep and deer were hunted throughout the year in the Sierra Nevada. Bighorn sheep hunting also appears to have been important in the Coso Range. Other foods which supplemented the diet of the Little Lake Shoshone were fish from Little Lake, acorns from the eastern skirt of the Sierra Nevada, fly larvae from the shores of Owens Lake, and pandora moth larvae from Coso Hot Springs and Little Lake.

Social organization of the Little Lake Shoshone was similar to other Great Basin groups. The nuclear family and the village were the basic political and social units. The nuclear family was for the most part a self-sufficient unit in most economic matters. Headmen were the only permanent leaders, and this position was usually inherited. Responsibilities for this office were confined to suggesting settlement locations and directing communal activities.

Marriage practices were loosely structured. A negative marriage rule was enforced which prohibited the marriage of individuals related in any way within several generations. Intertribal marriages occurred and were noted with Tübatulabal, Kawaiisu, and Owens Valley Paiute.

No published information is available on the trading relations of the Little Lake Shoshone.

Both the Kawaiisu and Little Lake Shoshone had concepts regarding property similar to the Tübatulabal. Family or band ownership of food areas were largely unknown.

Summary

From the ethnographic and linguistic information presented a pattern of land use for the three ethnolinguistic groups considered becomes evident.

The Tübatulabal can best be seen as Californian in orientation. Inhabiting the South Fork Valley and Kern Plateau they were characterized by a fairly large population and semi-sedentary settlements. They preferred the area of the southern Sierra Nevada where economic resources were more abundant and traveled into the desert only for short occasions to trade or procure specialized resources unavailable in their native homeland. The language they spoke contrasted with their neighbors and was unintelligible to either the Kawaiisu or Panamint Shoshone. Activities within the higher elevations of the Sierra Nevada focused on a dual settlement structure for pinyon exploitation. Working from base camps located at lower elevations of the pinyon zone, and smaller more ephemeral pinyon stations at higher elevations, nuts were procured throughout a three month period.

The Kawaiisu and Little Lake Shoshone can best be considered as Great Basin peoples both in language and in subsistence-settlement practices. Although the Kawaiisu held tenaciously to the more well-watered slopes of the Tehachapi Mountains, the region had few streams, and a large portion of their territory incorporated areas of the desert. Populations were most likely fairly mobile and did not attain the degree of sedentism of the Tübatulabal. Their language belongs to the Numic group found in the Great Basin, and they appear to have had considerable interaction with the Panamint Shoshone.

With the Panamint Shoshone we come to a more typical Great Basin group. In all aspects the Panamint Shoshone would fit the general model

advanced by Steward for arid lands hunter-gatherers of the basin-plateau region: simple social and political organization, highly mobile subsistence-settlement system, and quite low population density.

Both the Kawaiisu and Panamint Shoshone relied on pinyon as an important source of storable winter food. Pinyon procurement does not appear to be as highly structured as the Tübatulabal. No explicit statement is found for the settlement structure of pinyon exploitation for these groups, but it seems safe to conclude that they spent less time in this zone and did not have the elaborate base camps of their neighbors, the Tübatulabal.

RESEARCH OBJECTIVES

(Author's Preface -- The following is a summarized version of the original technical proposal submitted to the Bureau of Land Management. For the sake of clarity and brevity the major research objectives and corresponding methodologies have been briefly outlined. A copy of the entire technical proposal is on file at Bakersfield District Office of the Bureau of Land Management.)

Prior to 1977, the southern Sierra Nevada, directly north of Walker Pass, was essentially an archaeological unknown. Research along the Lamont Meadow and Morris Peak Segments of the Pacific Crest Trail (Garfinkel, *et al*. 1979) represents the first systematic archaeological reconnaissance of this area. This research produced several tentative models to explain the variability in the form and content of the archaeological record.

The Bear Mountain Segment of the Pacific Crest Trail is not only situated in the same environmental context as the Lamont Meadow/Morris Peak Segments (mixed coniferous woodland of predominantly pinyon), but is located just 2 to 15 km from these areas. Research along the Bear Mountain Segment affords a unique opportunity to test the regional models developed during investigations of the Lamont Meadow/Morris Peak areas.

Part I of the research strategy will address the postulated culture history of the southern Sierra Nevada, with an emphasis on the development and antiquity of pinyon exploitation. This will be followed in Part II by a discussion of the prehistoric ethnolinguistic affiliations of the Bear Mountain Segment.

It is also recognized that the Bear Mountain Segment represents a 760 m elevational transect through predominately pinyon woodland. As such, the archaeological sites located in the study area may provide a representative range of prehistoric subsistence-settlement activities occurring in upland pinyon areas. Part III of the research strategy presents a series of tentative statements concerning prehistoric land use patterns in upland pinyon areas of the southern Sierra Nevada.

Part I

Culture History -- The Antiquity of Pinyon Exploitation

Ethnographic information (Voegelin 1938; Zigmond 1938; Grosscup 1977) as well as recent archaeological research (Garfinkel and McGuire 1979) suggest that the Bear Mountain Segment was predominately a pinyon procurement locality in the seasonal subsistence cycle of the Tübatulabal. It may also be that desert-oriented groups such as the Little Lake Shoshone exploited parts of the expansive pinyon stands of this area of the Sierra Nevada (Garfinkel and McGuire 1979). In both circumstances evidence points to the critical importance of pinenut resources in the seasonal subsistence pursuits of the aboriginal inhabitants of the southern Sierra Nevada.

The ethnographic importance of pinyon exploitation within the western Great Basin and southern Sierra Nevada (Steward 1938; Voegelin 1938)

has led several researchers to posit a lengthy antiquity for pinyon procurement systems (Lanning 1963; Davis 1963). Indeed, Jennings (1964) has postulated a lifeway, in the form of the "Desert Culture," involving a generalized exploitation of all available resources, similar to that described for the ethnographic present, extending back for some 10,000 years.

Other investigators have suggested significant variability in subsistence pursuits during various periods of western Great Basin prehistory (Baumhoff and Heizer 1965; Bedwell 1973). More specifically, Robert Bettinger (1976) has stated, based on archaeological evidence from Owens Valley, that pinyon exploitation may have been nonexistant in central eastern California prior to A.D. 600.

Kelly McGuire and Alan Garfinkel have disputed Bettinger's position suggesting instead, based on evidence from the Lamont Meadow and Morris Peak areas of the southern Sierra Nevada, that the transition to a major reliance on pinyon exploitation began at approximately 1200 B.C. (McGuire and Garfinkel 1979). Their hypothesis is based not only on the surface distribution of time-sensitive projectile points, but on subsurface materials and contextual relationships as well.

In addition, McGuire and Garfinkel suggest that, beginning at approximately 1200 B.C., the intensity of pinyon exploitation increased during each subsequent phase up to the ethnographic present. In pinyon-juniper areas of the Owens Valley (Bettinger 1975) and the southern Sierra Nevada (McGuire and Garfinkel 1979), beginning at 1200 B.C. and continuing to the historic period, the number of time-sensitive projectile points increases for each successive phase even though the phase lengths are of shorter duration. It is inferred that this increase is the result of greater exploitation of pinyon resources. (See McGuire and Garfinkel 1979 for a further discussion of this point.)

It is the contention of this proposal that the prehistory of the western Great Basin and southern Sierra Nevada can best be seen as a series of highly variable human adaptations to a number of heterogeneous environmental contexts. Several researchers (Bettinger 1975; McGuire and Garfinkel 1976; McGuire and Garfinkel 1979) have suggested a relatively late development of prehistoric pinyon exploitation in central eastern California and the southern Sierra Nevada. Based on the preliminary results of archaeological reconnaissance in the Lamont Meadow and Morris Peak areas of the southern Sierra Nevada, it is proposed that research along the Bear Mountain Segment will demonstrate:

1) the transition to a major reliance on pinyon exploitation began at approximately 1200 B.C. Before this time upland pinyon areas of the Sierra Nevada were either unoccupied or were the loci of isolated hunting activity;
2) the intensity of pinyon exploitation, beginning at 1200 B.C., gradually increases through each successive phase up to the ethnographic present.

The utility of certain methods of chronological control toward the testing of the above hypotheses has already been demonstrated for this area of the southern Sierra Nevada (Garfinkel _et al_. 1979). These methods include:

1) typological and subsequent temporal identification of all projectile points recovered using the criteria set forth in David Thomas', "Key to Western Great Basin Projectile Points" (1970; Thomas and Bettinger 1976:280-287);

2) source specific obsidian hydration date determinations for all projectiles recovered as well as from selected debitage samples from all test excavation units;
3) determinations of temporal significance for all beads, as well as all pottery fragments.

Part II

Ethnolinguistic Affiliation of the Bear Mountain Segment

The extreme southern Sierra Nevada crest forms a discrete hydrological and environmental boundary between the Kern River drainage to the west and the Great Basin to the east. Not surprisingly, the crest of the southern Sierra Nevada also formed the general boundary between the distinctive subsistence-settlement pursuits of three aboriginal ethnolinguistic groups. These three groups include; the Tübatulabal of the Kern River drainage, and the Little Lake Shoshone and Kawaiisu (Numic speakers) of the western Great Basin (Voegelin 1938; Zigmond 1938; Grosscup 1977). All three of these groups were hunter-gatherers who practiced a pattern of seasonal transhumance: movement in response to the differential availability of major vegetal resources within their territories and to the movement and abundance of particular animal species.

Pinyon pine is the major economic plant resource of the Bear Mountain, Lamont Meadow, and Morris Peak areas of the Pacific Crest Trail. The importance of pinyon exploitation in the seasonal subsistence cycle of both the Tübatulabal (Voegelin 1938; Butterbrett 1948) and the Little Lake Shoshone (Steward 1938) made the expansive pinyon forests of the southern Sierra Nevada an attractive procurement locality for both groups. Indeed, while most ethnographic information (Voegelin 1938; Zigmond 1938; Grosscup 1977) suggests that the Tübatulabal occupied the Kern drainage east of the Sierra Nevada crest, there is also a consensus that both the Little Lake Shoshone and Kawaiisu may have occasionally ventured into the western fringe of the Kern River drainage (e.g. Walker Pass and Canebrake Creek) (Voegelin 1938; Grosscup 1977). Ethnographic information indicates a degree of geographical convergence in the seasonal subsistance pursuits of the Tübatulabal and Numic groups (Little Lake Shoshone and Kawaiisu) centered in the pinyon areas on and adjacent to the southern Sierra Nevada crest.

As a further refinement, Garfinkel and McGuire (1979) have suggested based on evidence from their work along the Lamont Meadow and Morris Peak Segments of the Pacific Trail, that there was a general tendency for prehistoric Numic groups to more actively exploit the pinyon areas of the Sierra Nevada crest and eastern Sierra Nevada scarp while Tübatulabal groups would have utilized the more western pinyon stands to the north of the Kern River Valley.

Based on the hypothesis of Garfinkel and McGuire (1979), the form and content of the archaeological record of the southern Sierra Nevada can be explained, in part, as the result of this border area separating two ethnolinguistic families and their prehistoric counterparts, including: (1) Numic speakers (Kawaiisu and Little Lake Shoshone) of the western Great Basin and, (2) the Tübatulabal of the Kern River drainage. The prehistoric geographic boundary is considered to have been the Sierra

Nevada crest that separates the drainages of the Kern River from the Great Basin. In addition, Garfinkel and McGuire (1979) suggest this division is of long standing, perhaps extending back to 1200 B.C.

Several procedures and analyses involving archaeological and linguistic data were used by Garfinkel and McGuire (1979) in support of their model. These include:

1) an analysis of diagnostic rock art characteristics of both Numic and Tübatulabal groups and their areal distribution;
2) an analysis of obsidian and chalcedony source locations, as well as a quantification of the frequency representation of these flaked stone materials at archaeological sites within the southern Sierra Nevada. There appears to be a marked tendency for the use of chalcedony among the Numic groups who inhabited the Indian Wells Valley/El Paso Mountains area adjacent to the eastern scarp of the southern Sierra Nevada. In contrast the Tübatulabal exhibit almost an exclusive preference for obsidian;
3) an analysis of raw material used in the manufacture of portable milling equipment. Not surprisingly, Numic populations tended to use local desert volcanic material such as scoria and basalt, while Tübatulabal groups preferred granitic rock;
4) an analysis of both Numic and Tübatulabal winter village locations and their proximity to pinyon resources;
5) reference to linguistic sources to identify the origins and date of divergence of Tübatulabalic and Numic language groups;
6) an analysis of independent archaeological chronometric data and its relationship to the suggested date of divergence of the two language groups.

The Bear Mountain Segment of the Pacific Crest Trail provides the archaeologist a unique opportunity to further test the model presented by Garfinkel and McGuire (1979). If the Sierra Nevada crest formed a prehistoric ethnolinguistic boundary between Numic and Tübatulabal populations, it is then predicted that the Bear Mountain sites, which are located 5-15 km west of the crest, would be the archaeological manifestations of the Tübatulabal ethnolinguistic group.

The 15 sites located along the Bear Mountain Segment should provide a large inventory of flaked stone, portable milling equipment, chronometric information, as well as an expected sample of rock art. These data sets combined with the analytical program instituted by Garfinkel and McGuire (1979) and restated on the preceeding page, should clarify the ethnolinguistic affiliation of the Bear Mountain Segment of the Pacific Crest Trail.

Part III

<u>Prehistoric Land-Use Patterns in Upland Pinyon Areas of the Southern Sierra Nevada</u>

The Bear Mountain Segment consists of a series of 15 archaeological sites spanning a 760 m elevational transect of predominately pinyon-juniper woodland. As such, the scope of this study does not permit a regional inquiry into the total Tübatulabal subsistence-settlement pattern but is limited to one aspect of this system: activities including and associated with prehistoric pinyon exploitation. Further, the study area

is dictated by the vagaries of government trail construction rather than a systematic regional sampling procedure (see Struever 1971; Thomas 1971; and Bettinger 1975).

Although the above concerns present certain limitations, these problems are somewhat mitigated by a large sample of 19 archaeological sites already systematically investigated in the pinyon areas of the Lamont Meadow and Morris Peak trail segments and 15 sites scheduled for investigation along the Bear Mountain Segment. These 34 archaeological sites exhibit a degree of variability in size, tool types, frequencies and types of food remains, and environmental contexts. It is an explicit assumption of this research design that these 34 archaeological sites provide a representative range of prehistoric subsistence-settlement activity occurring within pinyon areas of the southern Sierra Nevada.

The aims of this research strategy are to elucidate this variability in this subsistence-settlement pattern, the end result being an integrated model of subsistence-settlement site types and their areal articulation.

In very general terms, a subsistence-settlement pattern can be seen as a system of interrelations between loci of human occupation (sites) (Thomas 1971). More specifically, this study will focus predominately on an 'ecological approach' (Trigger 1968) which views settlement patterns in terms of the relationships between sites, subsistence, technology, and environment. To operationalize this approach Struever (1971) states,

> "The analysis of kind, number, and distribution of material elements recovered from an archaeological site enables the archaeologist to define tool kits, activity sets, and activity areas. These are the building blocks upon which settlement types are defined. . . Sites in or from which particular exploitive or maintanence tasks were carried out will disclose a similar structure of material elements; all such sites are representative of a single settlement type."

These distinct settlement types are then organized and inter-related in such a way as to form a unified subsistence-settlement system.

Previous archaeological research in the southern Sierra Nevada Mountains (Garfinkel, et al. 1979) has indicated several promising methodological and technical avenues for the reconstruction of site function(s) and subsequent delineation of an upland subsistence-settlement pattern. These include:

1. recovery and analysis of all subsurface plant and animal remains;
2. functional and technological analysis of flaked-stone material;
3. botanical analysis of extant vegetative cover;
4. functional analysis of certain ground stone morphological types and rock-ring features;
5. utilization of ethnographic data pertaining to pinyon zone subsistence-settlement strategies; and
6. computer assisted site-typology formation.

Ethnographic information (Voegelin 1938) already alludes to a hierarchical structure of southern Sierra pinyon settlements involving (1) large pinyon base camps, and (2) smaller pinyon stations (see ethnographic section, this report). In addition, Voegelin (1938) also mentions a number of adjunct subsistence activities that co-occur with the fall pinyon harvest (e.g. procurement of juniper berries, fish, small game, birds, and deer). Some tentative support of Voegelin's generalized settlement model was obtained during archaeological investigations along the Lamont Meadow/Morris Peak Segment of the Pacific Crest Trail.

Research along the Bear Mountain Segment will attempt to test Voegelin's ethnographic model of upland (pinyon-juniper zone) Tübatulabal subsistence-settlement strategies as well as to identify the nature and intensity of certain adjunct subsistence activities that co-occur with late-summer and fall pinyon procurement. The end result shall be an integrated model of prehistoric land use patterns within the pinyon areas of the southern Sierra Nevada Mountains.

CHRONOMETRICS

As stated in the Research Objectives of this monograph, a major aim of these archaeological investigations is the elucidation of the nature and antiquity of pinyon exploitation in the southern Sierra Nevada. Such an ambitious synthesis is dependant upon the reliable dating of the archaeological components represented along the Bear Mountain Segment. Toward this end a program of analyses involving temporally-sensitive projectile points, chronologically diagnostic shell, stone, and glass beads, and source-specific obsidian hydration dating have been undertaken.

This chapter shall: (1) discuss the methods and results of chronometric techniques employed, (2) present a cultural-historical summary of the project area, and (3) discuss the inception and nature of prehistoric pinyon exploitation in central-eastern California.

PROJECTILE POINTS

Typology

Examination of the 15 archaeological sites included in the present study revealed 57 objects identified as projectile points, thirty-five of these were complete enough to allow classification. All of these classifiable projectile points are illustrated in Figures 2, 3, 4, and 5.

Projectile points were classified through the use of David Thomas' "Key to Western Great Basin Projectile Points" (1970; Thomas and Bettinger 1976:280-287). This procedure was previously used for points found in the study area (Garfinkel *et al*. 1979) and was found to be highly valid and quite reliable. Its continued use is recommended for other researchers conducting archaeological studies in the region.

The use of Thomas' key allows sorting of points into consistent categories. Nine operationally-defined attributes are used to determine point types (see Thomas 1970 and Thomas and Bettinger 1976 for a full discussion on the use of his key). Attribute measurements for each classifiable projectile point are presented in Table 2.

Point types and their associated frequencies are listed below.

Point Series (P)		1
Sierra Concave Base (SCB)		3
Humboldt Series		1
Humboldt Concave Base - A (HCB-A)	1	
Elko Series (E)		1
Rose Spring/Eastgate Series		9
Rose Spring Contracting-Stem (RSCS)	8	
Eastgate Expanding Stem (EsEs)	1	
Cottonwood Series		14
Cottonwood Triangular (Cot Tri)	14	
Desert Side-Notched Series (DSN)		6
		35

All but two projectile points fall into types previously identified as present within the study area (Garfinkel *et al*. 1979). An example of an Elko series point and a point of an indeterminant type are the additional examples found in the current collection.

Table 2

Attributes for Projectile Points of the
Bear Mountain Segment of the Pacific Crest Trail
(Variates in parentheses are for broken artifacts)

Catalogue No. Site No.	Type	Length Maximum	Length Axial	Width Maximum	Width Basal	Thickness	Distal Shoulder Angle	Proximal Shoulder Angle	Weight	Wt. Estimate
39-008	Cot Tri	14.8	14.8	8.5	8.5	2.9	--	--	.4	--
39-203	RSCS	24.9	24.9	9.3	5.3	4.2	200°	90°	.9	--
39-347	HCB-A	(10.5)	(9.5)	15.8	11.4	5.0	--	--	--	3.0
39-528	RSCS	17.8	17.8	12.9	9.6	2.3	200°	100°	.5	--
39-850	Cot Tri	(20.0)	(17.5)	12.3	12.3	3.4	--	--	.5	.7
41-097	Cot Tri	23.7	23.7	15.6	15.6	5.0	--	--	1.6	--
41-102	DSN	(23.1)	(23.1)	8.8	8.8	3.1	210°	150°	.8	--
41-103	DSN	(22.4)	(20.4)	14.3	14.3	3.0	220°	150°	.8	1.2
41-334	RSCS	(21.0)	(21.0)	9.0	3.2	2.3	185°	85°	.9	1.2
41-549	Cot Tri	20.9	20.9	10.9	10.9	2.7	--	--	.6	--
41-550	Cot Tri	21.9	21.9	13.2	13.2	2.7	--	--	.7	--
41-551	RSCS	21.5	21.5	15.0	7.3	4.6	180°	110°	1.1	--
41-680	DSN	22.7	20.5	10.2	10.2	2.1	165°	195°	.4	.8
41-681	DSN	(18.0)	(16.0)	(11.3)	(11.3)	--	150°	190°	.3	.6
41-682	DSN	(20.7)	(17.3)	7.8	7.8	--	180°	200°	.2	.5
41-683	RSCS	27.4	27.4	15.0	7.2	5.3	185°	95°	1.8	
41-897	Cot Tri	25.0	21.4	(15.0)	(15.0)	3.4	--	--	--	--
41-899	RSCS	19.8	19.8	13.6	7.1	2.5	190°	95°	.5	--
42-037	Cot Tri	20.6	19.9	11.0	11.0	3.6	--	--	.5	--
42-136	RSCS	33.4	33.4	11.2	9.2	4.5	210°	140°	1.3	--
42-137	Cot Tri	(21.9)	(21.9)	10.1	10.1	2.8	--	--	.4	.6
42-205	Cot Tri	28.5	28.5	14.3	13.5	4.6	--	--	1.7	--
42-567	DSN	23.2	20.8	12.2	12.2	3.8	230°	170°	.8	--
43-027	SCB (HB-N)	(30.0)	22.3	22.6	20.3	7.4	--	--	3.8	--
43-032	Indeterminate	21.2	21.2	21.5	21.3	--	190°	145°	1.8	--
48-184	SCB (HB-N)	(45.0)	(35.0)	(29.0)	(29.0)	7.0	--	--	2.5	8.0
50-017	P	(38.0)	(34.7)	27.0	19.0	8.8	190°	100°	6.6	--
53-074	ESES	37.7	37.7	18.9	6.9	--	100°	160°	1.9	--
57-040	Cot Tri	(30.0)	(30.0)	16.8	16.8	3.6	--	--	.7	2.0
57-286	Cot Tri	19.4	18.5	8.6	8.6	2.3	--	--	.4	--
57-428	E	(37.0)	(32.0)	(34.0)	(28.0)	6.2	160°	130°	8.0	14.0
57-429	SCB (HB-N)	45.0	35.0	(34.0)	(34.0)	6.7	--	--	2.0	8.0
60-035	Cot Tri	(17.5)	(16.7)	9.8	9.8	2.4	--	--	.4	--
71-001	RSCS	26.0	26.0	14.9	10.6	3.3	140°	170°	1.1	--
71-019	Cot Tri	23.6	23.6	10.0	10.0	3.0	--	--	.8	--
73-004	Cot Tri	(22.0)	(22.0)	(9.0)	(9.0)	3.3	--	--	.5	.8

Garfinkel and his associates recognized five types of points which were useful as time markers. All but one of these types, the Sierra Concave Base, were previously recognized as time marker point types within the Great Basin. The Sierra Concave Base point form is quite similar in form to the point type labelled in the Great Basin as Humboldt Basal-Notched but appears to possess a distinctively different temporal affinity and spatial distribution. The Sierra Concave Base type can be easily classified using Thomas' existing criteria for the Humboldt Basal-Notched form. A thorough discussion of the typology, chronological implications and spatial distribution for the Sierra Concave Base form has been previously detailed (Moratto 1972:256-258; Garfinkel et al. 1979).

Further discussion concerning typological and temporal considerations for all the point forms identified will be found below.

Desert Side-Notched Series

The Desert Side-Notched Series was first defined by Baumhoff and Bryne (1959). In this seminal study they described four varieties: "General", "Sierra", "Redding", and "Delta". Only two of these varieties, General and Sierra, have been identified within the study area, and only the Sierra variety is found in the present collection (Fig. 2). Radiocarbon determinations suggest a date of A.D. 1300 to A.D. 1870 for this point form (Hester and Heizer 1973; Bettinger and Taylor 1974).

Cottonwood Series

The Cottonwood Series was originally delineated by Edward Lanning (1963) and included a "triangular" and "leaf-shaped" variety. Heizer and Clewlow (1968) added a third variety "bipointed". Archaeological study in the southern Sierra Nevada has delineated only the "triangular" variant of the Cottonwood Series.

Cottonwood Series points also span the time period from ca. A.D. 1300 to A.D. 1870 (Bettinger and Taylor 1974) and as such are found to be contemporaneous with Desert Side-Notched points. Both forms are associated with the late prehistoric sites in many parts of California and throughout the Great Basin.

These time-marker point forms correspond to the Chimney phase (A.D. 1300-historic) in the local sequence developed through previous archaeological investigations in the southern Sierra Nevada (Garfinkel et al. 1979). These phase designations have general utility and will continue to be used in the present study.

Rose Spring/Eastgate Series

Lanning (1963) was the first to define the Rose Spring series at the archaeological site of the same name. He identified three variants: "corner-notched," "side-notched," and "contracting-stem". The two latter variants have been described within the general study area (Garfinkel et al. 1979). The present study identifies only the contracting-stem variety.

Eastgate "expanding stem" and "split stem" points were initially

Fig. 2. Desert Side-Notched Projectile Points*

a. 41-102

b. 41-103

c. 41-680

d. 41-681

e. 41-682

f. 42-567

*All projectile points drawn to scale

a

b

c

d

e

f

Fig. 3. Cottonwood Triangular Projectile Points*

a. 39-008

b. 39-850

c. 41-097

d. (41-337-unclassifiable)

e. 41-549

f. 41-550

g. 41-897

h. 42-037

i. 42-137

j. 42-205

k. 57-040

l. 57-286

m. 60-035

n. 71-019

o. 73-004

*All projectile points drawn to scale.

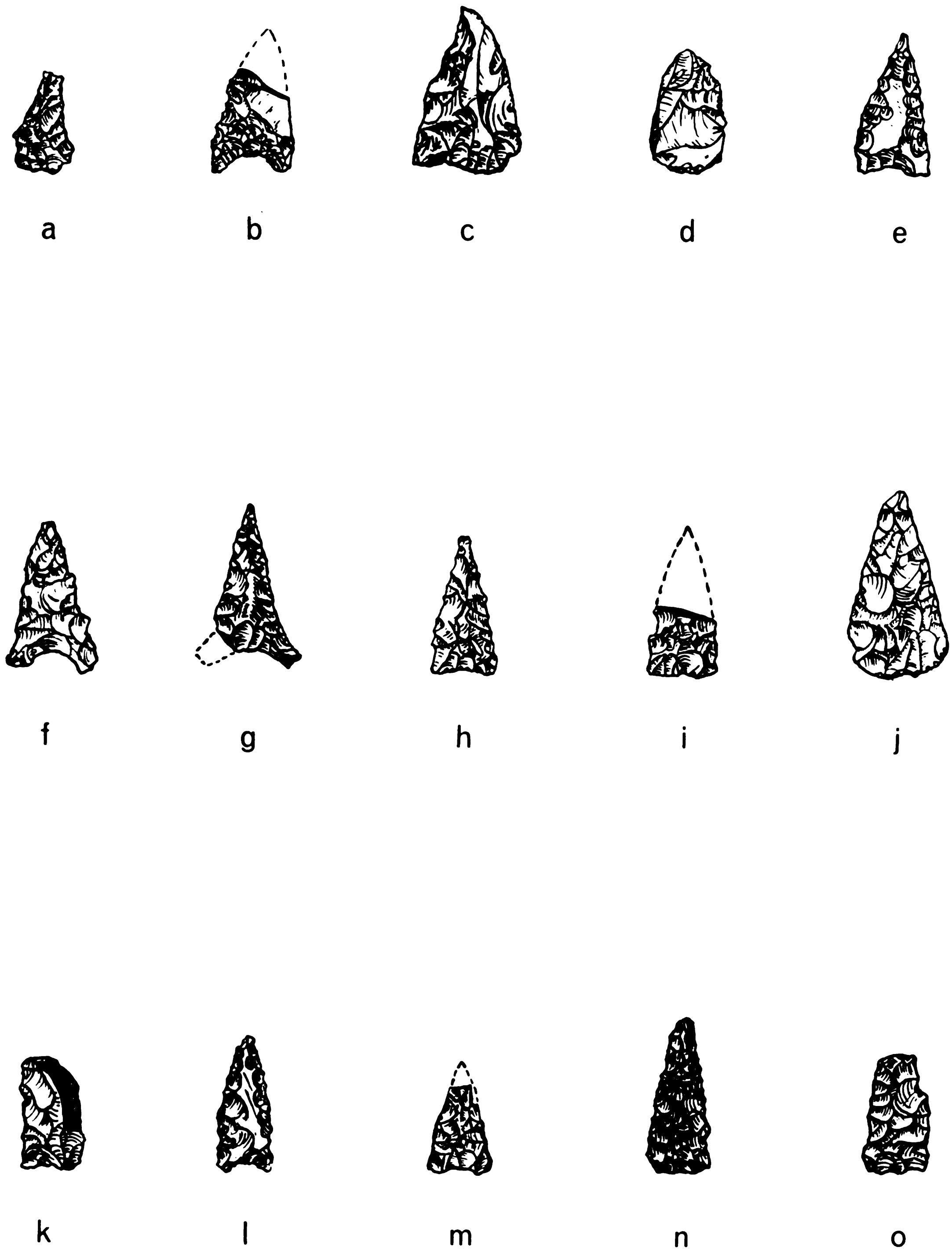

a
b
c
d
e
f
g
h
i
j
k
l
m
n
o

Fig. 4. Rose Spring Contracting-Stem Projectile Points*

a.	39-203	d.	41-551	g.	42-136
b.	39-528	e.	41-683	i.	71-001
c.	41-334	f.	41-899		

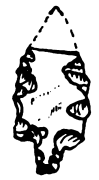
Eastgate Expanding-Stem Projectile Point

h. 53-074

*All projectile points drawn to scale.


a


b


c


d


e


f


g


h


i

Fig. 5. Sierra Concave Base Projectile Points*

a. 48-184

b. 43-027

c. 57-429

Elko Eared Projectile Point

d. 57-428

(e. 43-032 - unclassified)

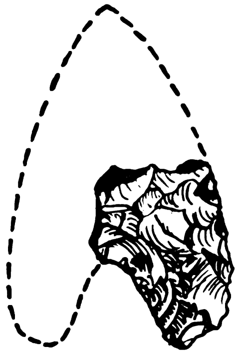
Humboldt Concave Base A Projectile Point

f. 39-347

Pinto Projectile Point

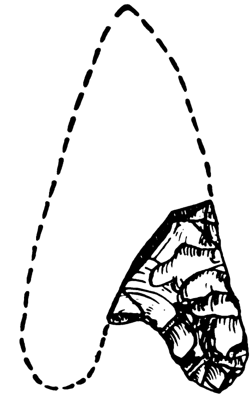
g. 50-017

*All projectile points drawn to scale.



a

b



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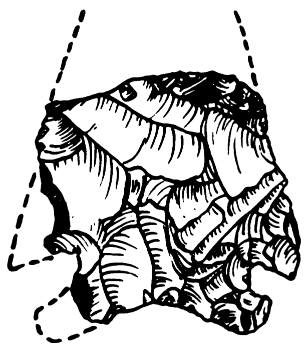
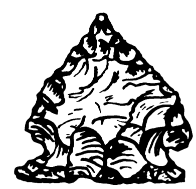
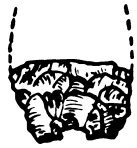


d



e



f

g

described by Heizer and Baumhoff (1961). Only the "expanding stem" variety has been recognized within the region of the southern Sierra Nevada (Garfinkel et al. 1979), a determination which the present study affirms.

Rose Spring and Eastgate points have been found to be largely contemporaneous dating from A.D. 600 to A.D. 1300 (Bettinger and Taylor 1974). Study within the southern Sierra Nevada indicates a greater popularity for the former point form while the latter form is rare in occurrence.

Rose Spring and Eastgate points mark the Sawtooth phase (A.D. 600 to A.D. 1300) in the local sequence suggested for the southern Sierra Nevada.

Elko Series

Elko points were originally defined by Heizer and Baumhoff (1961) and include three variants: "side-notched", "corner-notched", and "eared". A "contracting-stem" variety has also been suggested (Clewlow 1967; Thomas 1970).

The present study identifies a single Elko series point which types, using Thomas' key, to the Elko contracting-stem variant. Examination of the configuration of this point (Fig. 5) suggests this classification to be in error. The point compares more favorably with the "eared" variant of the Elko point form. From inspection of the critical attributes in Thomas' key it appears that the basal width - maximum width ratio for this point is smaller (.8) than is traditional ($\geq$ .9) for similar points in the western Great Basin. Such a slight difference most likely owes to regional variability in the general morphology of the "eared" variant of the Elko series. This is the first documented occurrence of an Elko series projectile point in this region of the southern Sierra Nevada.

A radiocarbon range of 1200 B.C. to A.D. 600 is commonly attributed to the Elko series (Hester and Heizer 1973; Bettinger and Taylor 1974). This time range is coterminous with the Canebrake phase (1200 B.C. - A.D. 600) in the proposed local sequence.

Humboldt Series

The Humboldt point type was originally proposed by Heizer and Clewlow (1968) based on archaeological materials from the Humboldt lake bed site. Three varieties of Humboldt series points have been described: "Concave Base A", "Concave Base B", and "Basal-Notched". The Humboldt Concave Base A variant has the widest spatial distribution and is the only form within this series identified in the present collection. Radiocarbon determinations are available for Humboldt Concave Base A points from the eastern Great Basin. These dates range from 5500 to 3000 years B.P. (Hester and Heizer 1973). Other dates of more recent age have been suggested for these points (Bettinger 1975:12; Thomas and McKee 1973).

Stratigraphic information and source-specific obsidian hydration dating (to be discussed under the heading Obsidian Hydration) lead to the conclusion that this particular point form within the region of the southern Sierra Nevada would date to a time range contemporaneous with the Elko series. If this is a valid inference, such points would fall into the Canebrake phase in the local sequence.

Sierra Concave Base

The single point form identified within the study area that does not easily fall within the previously defined time-marker Great Basin series is the Sierra Concave Base. The type Sierra Concave Base (SCB) was initially described by Moratto (1972:256-258) based on his work at Buchanan Reservoir. He describes these points as long, heavy, well made points with symmetrical lanceolate or leaf-shaped blades and subconcave to deeply concave or notched bases; the basal concavity leaves bilateral tangs which are set parallel to the long axis of the point, some examples having a parallel oblique flaking pattern. The Buchanon sample of 73 specimens classified as SCB gave length ranges from 34 to 110 mm ($\bar{x}$ = 64.6 mm), width ranges from 15 to 35 mm ($\bar{x}$ = 26.5 m) and a mean thickness of 8.7 mm. Weight ranges were from 4.2 to 35.0 grams ($\bar{x}$ = 14.8 g). SCB points recovered during the current study and from investigations of the Lamont Meadow/Morris Peak segments of the Pacific Crest Trail fall within these ranges of measurements used by Moratto to define the type. In an exhaustive list of previous finds and designations of this point form, Moratto lists occurrences in the northern and southern San Joaquin Valley, California Delta, northern and central Sierra Nevada, and eastern California desert areas. Radiocarbon determinations for burials associated with this point form at Buchanon Reservoir gave dates of A.D. 110 ± 95, A.D. 150 ± 95, and A.D. 260 ± 155.

At the Raljon Site (Ca-Ker-479) near Bakersfield SCB points were found in association with several burials (R. Schiffman; personal communication). Radiocarbon determinations obtained from these burials provided dates of: A.D. 300 ± 110, A.D. 270 ± 150, and A.D. 270 ± 140. In addition, four SCB points were recovered from Ray Cave (Ca-Iny-344) in the Coso Range (Paralaqui 1974). All four of these points were found in close stratigraphic proximity and bracketed by radiocarbon dated levels of 1400 B.C. and A.D. 500.

From the above dates it would appear that the SCB is representative of the Canebrake Phase (1200 B.C. - A.D. 600) in the local sequence, although it's widest usage may have been toward the latter end of the phase. A postulated temporal range of 500 B.C. to A.D. 500 for this point form does not seem unreasonable.

However, not all researchers are in agreement with this suggested temporal span of SCB point forms. In a study of points which he classifies as Humboldt Basal-Notched (HBN) bifaces, Robert Bettinger (1978) includes collections which would fall into the Sierra Concave Base type. Included in this study are the points initially identified to be Sierra Concave Base at the type site of Buchanon Reservoir. Also included are points from Lanning's Rose Spring site excavated in the Owens Valley (1963:Pl 8g-1) as well as points identiifed by Emma Lou Davis in Mono County (1964). Bettinger suggests on the basis of other time-marker point types associated with the SCB type and the stratigraphic associations of these point forms that the SCB type dates between A.D. 600 and A.D. 1300 or essentially contemporaneous with the Rose Spring/Eastgate series.

In order to test these two different temporal models and in an effort to resolve the conflict surrounding the chronological positioning for the SCB point form, a series of source-specific obsidian hydration dates were

derived for points classified as SCB and HBN using both schema previously delineated.*

The points from the Rose Spring site were thought to be most conducive to this study since their provenience is well established and the site possessed a high degree of stratigraphic integrity. Those bifacially flaked stone forms identified as Type IV knives in Lanning's study correspond to our use of the term Sierra Concave Base and fit the typological criteria necessary for its inclusion in this form. Points from the present study and previous one along the Pacific Crest Trail (Garfinkel et al. 1979) were also available for study and have been analysed for source determinations and obsidian hydration measurement.

Available for analysis from the Maturango Museum were four points from the Ray Cave site (Panlaqui 1974) in the Coso Range classified as SCB types by our own determinations. Source determinations and measurement of the hydration bands were conducted on these points. All these points were found to have been manufactured from stone quarried at Sugarloaf Mountain in the Coso Range. This body of data provides a ready check on the contemporaneity between Rose Spring series points and SCB forms. A comparison of the hydration rim values of Rose Spring/Eastgate and SCB points can be made (Table 3). All of these points were collected within a distance of 30 kilometers from one another and were found in subsurface contexts which do not allow for great alterations in temperature (a variable which might affect the hydration process).

Inspection of Table 3 reveals only a slight overlap between Rose Spring/Eastgate and SCB point rim values. These samples possess distinctive mean rim values and significantly different distributions. A standard T test of significance between sample means indicates that the rim values of samples of SCB points are statistically more ancient than Rose Spring/Eastgate points ($p. < .001$).

Therefore, we conclude that the temporal framework proposed for the SCB point form in this current study (approximately 500 B.C. to A.D. 500) be maintained.

Pinto Series

The Pinto type was first identified by Amsden (1935:43-44) during archaeological investigations in the Pinto Basin directed by the Campbells (1935). Harrington (1957) and Lanning (1963) identified similar forms as Pinto in the Owens Valley and created a number of "subtypes" or varieties. Disagreement concerning the typological affinities of the Pinto series has been noted (Layton 1970; O'Connell 1971; Thomas 1971:89; Hester and Heizer 1973).

The single specimen typing to this series identified in the present study is of the variety usually termed "square shoulders". Hester and Heizer (1973:5) estimate the time when Pinto points were in use to ca. 3000 B.C. - 700 B.C. Bettinger and Taylor (1974:13) indicate a temporal span for these points from 4000 B.C. to 1200 B.C. The temporal placement suggested by the latter work will be followed here placing this point form in the Lamont phase (4000 B.C. - 1200 B.C.) in the local sequence.

*This study was supported by a small grant from the Great Basin Foundation and was aided by the encouragement of Dr. Emma Lou Davis.

Table 3

Comparison of Obsidian Hydration Rim Values for
Sierra Concave Base and Rose Spring/Eastgate Points

Catalogue No.		Type	Rim Value
Pacific Crest Trail (Garfinkel *et al*. 1979)			
20N-001		Rose Spring	1.81
20N-037		Rose Spring	3.73
20N-223		Eastgate	3.88
20N-262		Rose Spring	4.00
20N-436		Rose Spring	3.03
20N-674		Rose Spring	2.52
20N-733		Rose Spring	3.03
Pacific Crest Trail-- Bear Mountain Segment			
39-203		Rose Spring	2.43
39-528		Rose Spring	3.03
41-334		Rose Spring	2.22
41-683		Rose Spring	2.42
41-551		Rose Spring	1.01
N = 12		$\bar{X}$ = 2.76	σ^2 = .87
Ray Cave (Panlaqui 1974)			
68-87		SCB	3.03
67-93		SCB	4.54
67-82		SCB	5.05
67-1		SCB	3.53
Pacific Crest Trail Project (Garfinkel *et al*. 1979)			
20N-319		SCB	3.73
20N-692		SCB	6.56
Rose Spring (Lanning 1963)			
Riddell 1956 excavation	Provenience		
1-187809	0-12"	SCB	5.90
1-187891	12-24" D	SCB	4.78
1-188045	48-60" D	SCB	6.48
1-188213 Burial 2	36-48"	SCB	6.03
Heizer and Davis 1961 **excavation**			
1-144808	48-52" D-2	SCB	5.70
1-144838	66-72" D-2	SCB	5.72
1-144849	36-42" D-2	SCB	6.97
1-144901	24-30" D-2	SCB	6.19
1-144911	48-54" D-2	SCB	7.65
1-144915	48-54" D-3	SCB	5.70
N = 16		$\bar{X}$ = 5.47	σ^2 = 1.28

BEADS

The classification of shell, stone, and glass beads has temporal importance for five of the 15 archaeological sites under investigation. Particular styles of beads have been found in some cases to correspond to distinctive periods of time. Using a typology developed by Stephen Bass and Stephen Andrews (1977) we were able to generate chronometric inferences for the present assemblage. Their typology rests heavily on the works of others for coastal California (Gibson 1975) and other areas (King 1974; Bennyhoff 1958). A detailed presentation of their typology has been previously published (Bass and Andrews 1977; Andrews and Bass 1978) and is briefly enumerated again in Appendix 1.

A total of 60 beads were found at five of the 15 sites under investigation. Descriptions and proveniences for these beads are found in Appendix 1. Beads numbered 21 of stone, 8 of shell, and 31 of glass. The recovery of beads at these five sites provides additional information on the time periods represented.

Stone Beads

Stone disc beads occurred at three of the sites studied: KR-39, KR-41, and KR-42. These beads were manufactured of three materials: steatite (12), serpentine (1), and talc schist (8). The beads had diameters ranging from 2 to 9 mm and perforations ranging from 1 mm to slightly greater than 2 mm.

Gibson (1975) suggests a terminal date of ca. A.D. 1810 for stone disc bead use. Dating for the initiation of this type of bead is not firmly established. In the Owens Valley east of the study area, stone beads have been noted as occurring in the late context (Riddell and Riddell 1956; King 1974). In a recent publication (Garfinkel and Cook 1979) stone beads are suggested to initiate ca. A.D. 500 and discontinue during protohistoric times. Their greatest use may date to the earlier portion of this suggested temporal span.

Distribution: KR-39 (6); KR-41 (8); KR-42 (7).

Shell Beads

Shell beads occurred at only one site investigated during the present study: KR-39. A total of ten *Olivella biplicata* shell beads were recovered. These beads were of two types: *Olivella* callus cup and *Olivella* saucers. Only a single representative of the former type was noted and appeared in the 20-30 cm level. With a single exception all other shell beads appeared at lesser depths than the occurrence of the *Olivella* callus cup.

The *Olivella* callus cup bead style antedates a time near A.D. 1785. During the post-AD 1785 era *Olivella* saucers were manufactured and were refined having larger diameters and smaller perforations. This bead type begins ca. A.D. 1000 (Gibson 1975; Bennyhoff 1958).

Glass Beads

Glass trade beads were retrieved from four of the five sites to contain beads: KR-39, KR-41, KR-48, KR-60, and KR-73. Twenty-five glass beads of three different types were identified: cane (13), faceted (11), wire wound (1).

Particular subtypes of these bead forms have slightly different temporal spans. Cane beads date between 1675 and 1834. Seven varieties are found within the present assemblage: red oblate spheroid, black oblate spheroid, translucent red with opaque black center oblate spheroid, cobalt blue cylinder, turquoise copper blue oblate spheroid, opaque white oblate spheroid, and cobalt blue oblate spheroid. All but the last variety date to a period postdating A.D. 1816, the last bead variety originates during the 1780's.

Faceted glass beads were all of one variety: translucent cobalt blue with hexagonal facets and a tubular form. These beads date to a period more recent than A.D. 1816 (Gibson 1975).

The last type of glass bead, the wire wound type, is represented by only one example. This opaque white glass bead has been suggested to date from A.D. 1785 to A.D. 1816.

Distribution: KR-39 (18); KR-41 (2); KR-48 (1); KR-60 (3); KR-73 (1).

OBSIDIAN HYDRATION DATING

In order to date obsidian artifacts a program of obsidian hydration analysis was conducted. This data, used in conjunction with obsidian source identification analysis, allows the relatively precise dating of specimens using source specific obsidian hydration rates now available (Ericson 1977).

The analysis was carried out by Tony Drake (Washington State University, Pullman) at the obsidian hydration analysis facilities of the Department of Anthropology, University of California, Davis. Microscopic thin sections were prepared by cutting a 3 mm by 1.5 mm section from the edge of the artifact, by means of a Fecker Rock Saw with a diamond-edge blade, and grinding down this small piece to approximately half its original thickness. The section was mounted on a slide and sealed with a cover slip. The slide was then viewed through a Leitz Wetzlar microscope with a Leitz micrometer and under cross-polarized light provided by a Leitz Light Polarizer. Magnification varied from 500X to 1250X dependending on the size of the hydration rim being read, and during high-powered viewing an oil-immersion lens was used to aid in clarity. Actual measurements of the hydration band were taken at three or more locations along the band. These readings were averaged and the mean value is that which is presented here. An error factor of ± .2 microns exists due to the optical properties of the microscope and the variability among analysts. Rim values smaller than .5 microns can usually not be discerned using the techniques outlined here, and measurements of less than 1.0 microns are more apt to have larger error factors.

Previous research (Garfinkel *et al*. 1979) has indicated the general utility of source specific obsidian hydration dating as a chronological aid for use on specimens attributable to the Coso quarry. It appears

from previous study that dates derived using Jonathan Ericson's empirical source-specific mathematical dating equation (Ericson 1977:51, Equation 1-4)[1] for the Coso source are fairly consistent with accepted dates for Great Basin point series considered time-markers for interior southern California (Bettinger and Taylor 1974). The reader should bear in mind though that Ericson's rate is based on a linear regression of radiocarbon dates associated with a sample of obsidian hydration measurements. Readings from several obsidian samples were taken and then averaged which would increase the degree of error for his rate. The radiocarbon dates themselves have sigma values on the order of 70 to 150 years. Further the contextual relationships of some of the associated obsidian artifacts and carbonized material may be questioned due to the nature of cultural and natural disturbances to archaeological deposits. With all these considerations aired, it is most reasonable to consider the dates derived using Ericson's rate as only approximate dates.

Ericson himself has proposed several different rates for use on Coso obsidian and Meighan has formulated a slightly different rate based on burial data from the Malibu area (Ericson 1977, 1978; Meighan 1979). These expressions differ in their conception of how quickly the hydration band is formed. It has been determined through our own work that a period of some 340 years per micron is a good approximateion for dating of Coso obsidian and such a rate appears most internally consistent with independent dating techniques.

In addition to the measurements available from the preceding study by Garfinkel and associates, the present study has measured hydration rims on all subsurface projectile points and chemically characterized these specimens to source (Table 4). Without exception these points are attributable to the Coso quarry (Appendix 3). An examination of this total data set (both samples together) indicates increasing rim values for projectile point types of more ancient dates (Figure 6). These rim values indicate a chronological ordering which would be expected based on the accepted dates for these forms. Cottonwood and Desert Side-Notched points are significantly younger than the Rose Spring point series, and, as has been discussed previously, Sierra Concave Base points have significantly larger rim values than Rose Spring/Eastgate points indicating their greater age. The single Pinto series point has a rim value considerably greater than the largest reading of any SCB yet hydrated.

A one-way analysis of variance was performed to test the quality of sample means for the obsidian hydration rim values of three classes of temporally diagnostic projectile points: (1) Desert Side-Notched and Cottonwood Triangular, (2) Rose Spring and Eastgate, and (3) Sierra Concave Base. This analysis indicates these classes are significantly different at a probability level greater than .001 with an F value of 83.33 and 2 degrees of freedom. Further, the mean values of these various point types place each within the generally accepted temporal range of these point forms using Ericson's mathematical dating equation. An exception is the Cottonwood and Desert Side-Notched series which have derived dates that appear approximately 300 years too ancient.

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[1] Log T = log a + b (log x)
T = time in years before present
x = hydration measurement in microns
a and b are constants

<u>Coso Source</u> Log a. 2.6247
b. .932

Table 4

Hydration Measurements, Provenience, and
Derived Dates for Subsurface Projectile Points

Specimen No.	Type	Provenience		Rim Value (microns)	Date (B.P.)
39-008	Cot Tri	N4/W23	0-10	1.81	AD 1217
39-203	RSCS	N24/W6	20-30	2.43	AD 986
39-347	HCB-A	N7/W12	10-20	4.64	AD 188
39-528	RSCS	N21/W3	10-20	3.03	AD 766
41-097	Cot Tri	N0/E6	0-10	2.42	AD 990
41-102	DSN	N0/E6	0-10	1.41	AD 1370
41-103	DSN	N0/E6	0-10	4.74	AD 153
41-334	RSCS	N0/E6	40-50	2.22	AD 1064
41-549	Cot Tri	N0/E10	0-10	1.61	AD 1293
41-550	Cot Tri	N0/E10	0-10	1.65	AD 1278
41-551	RSCS	N0/E10	0-10	1.01	AD 1525
41-681	DSN	N0/E10	10-20	1.21	AD 1447
41-680	DSN	N0/E10	10-20	2.02	AD 1138
41-682	DSN	N0/E10	10-20	1.71	AD 1255
41-683	RSCS	N0/E10	10-20	2.42	AD 990

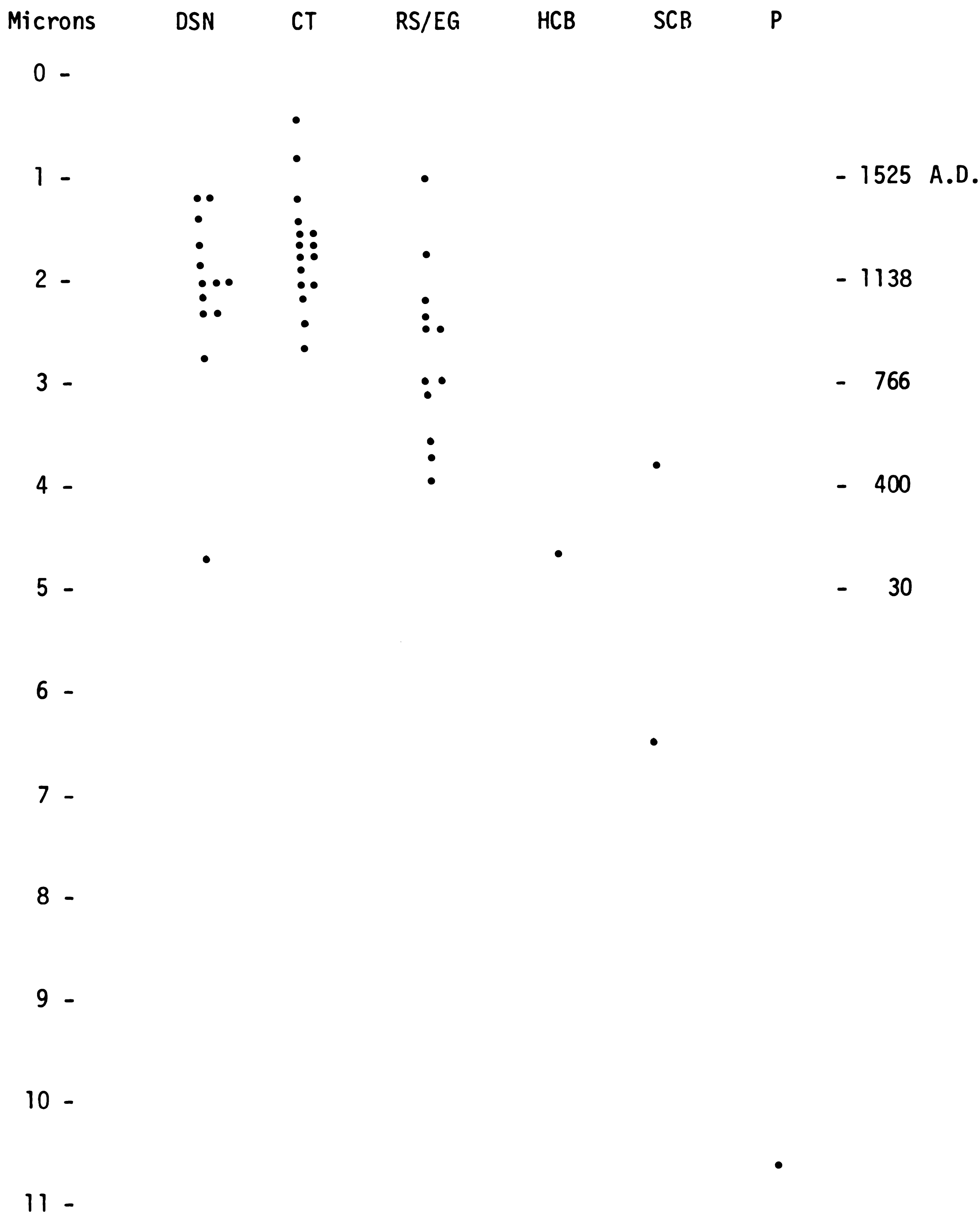

Fig. 6. Obsidian hydration rim values for subsurface projectile points recovered from archaeological sites located along the Lamont Meadow/Morris Peak and Bear Mountain Segments.

The various projectile point types are associated with the following obsidian hydration readings:

	$\bar{x}$	s	n
Desert Side-Notched*	1.92	.48	12
Cottonwood Series	1.65	.59	12
Rose Spring/Eastgate Series	2.79	.91	11
Sierra Concave Base**	5.47	1.28	16
Pinto	10.71		1

It may be suggested that the diffusion process for hydration of Coso obsidian initiates at an exponential rate and subsequently decreases to a more linear rate. This would explain a micron range of approximately .5 to 2.4 microns for the Desert Side-Notched and Cottonwood types which span a temporal period of some 600 years, while a similar temporal span for the Rose Spring series is only represented by micron values from approximately 2.4 to 4.0 microns.

Since source-specific obsidian hydration appeared to be such a valuable chronometric tool, it was anticipated that measurements on subsurface obsidian specimens of unmodified flakes could provide further data on the time periods represented for sites and stratigraphic levels not containing time-marker point forms. A sample was chosen in order to gain additional information for chronological controls. Obsidian samples from most levels of all excavation units were dated. This data is presented in Table 5. All specimens have been chemically characterized to the Coso source (Appendix 3). Derived dates using Ericson's mathematical model are included for inspection. These dates must be viewed with caution given the caveats previously noted for the most recent temporal periods (rim values < 2.0 microns), and in all cases should be considered as approximations with error factors on the order of ± 70 years.

CULTURE HISTORY SUMMARY

Below is presented a brief synthesis and description of each cultural phase proposed for the study area based on information gathered during the current research effort, and from archaeological investigations along the Lamont Meadow and Morris Peak Segments of the Pacific Crest Trail (Garfinkel _et al_. 1979).

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*This sample does not include point (41-103) which has a rim value of 4.74 microns. This value appears quite inflated and is a full 2.0 microns larger than any other Desert Side-Notched yet identified. This large rim value is most likely an artifact of the reworking of an older point and it was decided not to bias the results by including this anomalously large rim value in the sample.

**This is the total sample from a number of localities as discussed under the section on projectile points.

Table 5

Hydration Measurements, Provenience, and
Derived Dates for Subsurface Unmodified Flakes

Specimen No.	Provenience		H.M.	Date
39-016	N4/W23	0-10	2.02	AD 1138
39-027	N4/W23	10-20	5.15	AD 5
39-036	N4/W23	20-30	5.25	26 BC
39-077	N4/W23	30-40	3.83	AD 477
39-151	N24/W6	10-20	3.03	AD 766
39-260	N24/W6	40-50	2.22	AD 1064
39-274	N24/W6	50-60	4.44	AD 259
39-287	N7/W12	0-10	6.16	344 BC
39-375	N7/W12	20-30	5.05	AD 44
39-399	N7/W12	30-40	2.63	AD 916
39-420	N7/W12	40-50	4.80	AD 132
39-448	N21/W3	0-10	3.13	AD 729
39-527	N21/W3	10-20	3.03	AD 766
39-593	N21/W3	20-30	.85	AD 1588
39-629	N21/W3	30-40	.14	AD 1883
39-675	N21/W3	40-50	3.03	AD 766
39-702	N21/W3	50-60	3.63	AD 549
39-740	N21/W3	60-70	3.43	AD 621
39-752	N21/W3	70-80	6.06	309 BC
41-007	NO/E6	0-10	3.03	AD 766
41-110	NO/E6	10-20	2.72	AD 879
41-187	NO/E6	20-30	3.73	AD 513
41-233	NO/E6	30-40	3.53	AD 585
41-299	NO/E6	40-50	1.01	AD 1525
41-337	NO/E6	40-50	3.93	AD 442
41-340	NO/E6	50-60	4.04	AD 302
41-361	NO/E6	60-70	1.91	AD 1180
41-382	NO/E16	0-10	1.91	AD 1180
41-497	NO/E16	10-20	3.03	AD 766
41-533	NO/E16	20-30	4.04	AD 402
41-547	NO/E10	0-10	4.74	AD 153
41-630	NO/E10	10-20	1.11	AD 1486
41-689	NO/E10	20-30	2.32	AD 1027
41-726	NO/E10	30-40	1.41	AD 1370
41-738	S6/E12	0-10	2.72	AD 879
41-805	S6/E12	10-20	4.54	AD 224
41-859	S6/E12	20-30	3.33	AD 657
41-873	S6/E12	30-40	2.32	AD 1027
41-883	S6/E12	40-50	2.83	AD 839
41-889	S6/E12	50-60	2.32	AD 1027
41-894	S6/E12	60-70	3.03	AD 766

Site	Provenience		H.M.	Date
43-064	N8/E1	0-10	.75	AD 1628
43-067	N8/E1	10-20	2.52	AD 953
43-069	N8/E1	20-30	1.81	AD 1217
43-071	N8/E1	30-40	3.53	AD 585
43-075	N8/E1	40-50	3.43	AD 621
43-076	N8/E1	50-60	2.22	AD 1064
43-078	N8/E1	60-70	4.04	AD 402
50-044	S3/W5	0-10	2.02	AD 1139
57-427	N3/W1A	0-10	2.72	AD 879
57-441	N3/W1A	10-20	3.73	AD 513
57-452	N13/W4A	0-10	3.03	AD 766
57-457	N4/E0B	0-10	3.23	AD 673
57-473	N4/E0B	10-20	2.32	AD 1027
60-056	Rock Ring #1	0-10	5.00	AD 61
60-059	Rock Ring #2	0-10	3.30	AD 668
60-061	Rock Ring #2	10-20	2.42	AD 990
64-106	S10/E3	0-10	2.12	AD 1101
64-127	S10/E3	10-20	3.63	AD 549
64-134	S10/E3	20-30	2.35	AD 1016
64-141	S10/E3	30-40	1.81	AD 1227

Lamont Phase (4000 B.C. - 1200 B.C.)

The primary diagnostic criteria for this phase are Pinto series projectile points, of which only two specimens have been recovered during the course of archaeological investigations along the Bear Mountain Segment and Morris Peak-Lamont Meadow Segments of the Pacific Crest Trail. KR-50, a hunting camp, yielded a basalt Pinto projectile point as well as a large basalt biface. The use of basalt during this period has been previously noted by other researchers (Davis et al. 1963; Davis 1978). The fine-grained basalt used in these tools most likely came from quarries located in the Panamint Valley to the east (Davis et al. 1963).

It is suggested that during this occupation period small hunting parties would make sporadic forays into upland areas, such as the present study area, in search of large game. Base camps from which this activity eminated may have been located in the Owens and Indian Wells Valleys situated in riparian settings (e.g. Stahl site at Little Lake (Harrington 1957)).

Although hunting is seen as the primary upland subsistence pursuit during the Lamont Phase, the occasional unsystematic exploitation of upland plant (e.g. Pinyon) resources may have also occurred (c.f. McGuire and Garfinkel 1976).

Canebrake Phase (1200 B.C. - A.D. 600)

The first substantial evidence of extensive aboriginal occupation of upland pinyon areas occurs during this period. Projectile points of the Sierra Concave Base variety are the hallmark of this phase although their initial appearance may have occurred at 500 B.C. Elko and Humboldt Concave Base points are also identified but are quite rare. Hunting with dart and atlatl continued from the previous period. Milling equipment consists mainly (if not exclusively) of manos and metates. No ornaments have been identified during this time frame.

The settlement pattern during this period is characterized by the initial appearance of pinyon base camps and temporary pinyon stations at approximately 500 B.C. Primary subsistence pursuits during this time involve the systematic exploitation of pinyon nuts, the hunting of large and small game, and ancillary seed and bulb collection.

Sawtooth Phase (A.D. 600 - A.D. 1300)

Aboriginal use of the study area intensifies during this period. A greater number of sites are occupied and a transition to lighter arrow points of the Rose Spring and Eastgate series is noted, the latter point style being relatively rare in the region. Bedrock mortars and cobble pestles are used as are manos and metates. Stone beads also see their first use. These beads are manufactured of steatite, serpentine, and talc. Olivella spire-lopped beads are also identified but are rare.

As with the Canebrake phase, the settlement pattern is characterized by occupation of pinyon base camps, temporary pinyon stations, and temporary hunting camps. However, greater frequencies of obsidian and time sensitive artifacts from this phase suggest a more intensive level of occupation.

Chimney Phase (A.D. 1300 - Historic)

In this most recent period little change in the artifactual assemblage is noted. Small arrow points of the Desert Side-Notched and Cottonwood series typify the phase. Pottery (Owens Valley Brown Ware) is present but is insecurely dated. European glass beads, as well as Olivella disc beads, are also found in some numbers. Stone beads remain part of the assemblage but appear to decrease in popularity.

Subsistence-settlement structure remains essentially the same as the earlier Canebrake and Sawtooth Phases. However, further increases in the number of sites securely dated to this phase as well as increases in the frequency of phase-marker artifacts suggest the highest intensity of prehistoric occupation.

A synthesis of all available chronological information for each site located along the Bear Mountain Segment yields the following breakdown in phase representation;

	Chimney	Sawtooth	Canebrake	Lamont
KR-39	+	+	+	-
KR-41	+	+	+	-
KR-42	+	+	-	-
KR-43	+	+	+	-
KR-44	+*	+*	+	-
KR-46	-	+*	+	-
KR-48	+	-	+	-
KR-49	no datable material recovered			
KR-50	-	+*	-	+
KR-53	-	+	-	-
KR-57	+	+	+	-
KR-60	+	+	+*	-
KR-64	-	+*	-	-
KR-71	+	+*	+*	-
KR-73	+	-	-	-

*Occupation during these phases is considered extremely tentative based on a small sample of source-specific obsidian hydration dates.

DISCUSSION

Elsewhere (Garfinkel et al. 1979) it has been suggested that systematic pinyon exploitation began in the southern Sierra Nevada at approximately 1200 B.C. In addition, beginning at 1200 B.C. the intensity of pinyon exploitation increases for each successive phase up to the ethnographic present. These hypotheses are primarily based on the fact that time-sensitive projectile points first appear in significant quantities within pinyon areas during the Canebrake phase and that large increases are observed for each successive phase even though phase lengths are progressively shorter (see Garfinkel et al. 1979). The above hypotheses are based on the assumption that there is a relationship between the frequency of phase-marker projectile points and the intensity of pinyon exploitation.

Ethnographic information (Voegelin 1938) and archaeological data from the current study demonstrate that, within pinyon-juniper zones, land use practices are heavily weighted toward activities associated with pinyon procurement. Undoubtedly, the advent of a procurement system based on the systematic exploitation of pinyon provided aboriginal populations with the only stable means for extended occupation in upland pinyon areas. Not surprisingly, before the advent of systematic pinyon exploitation (Lamont Phase), activity in upland areas was extremely sporadic and restricted to a low level of hunting activity.

Indeed, even in more recent prehistoric and ethnographic periods it appears that, during the pinyon harvest, hunting activity was ancillary to pinyon procurement, tending to be based from existing pinyon camps (Voegelin 1938; Bettinger 1976:87). Thus, while several ancillary subsistence activities may have been practiced, the overall upland subsistence-settlement pattern was predominately supported by a single pinyon procurement system.

We simply suggest that the pinyon procurement system as it developed through time provided a stable subsistence base for increasing levels of upland occupation. These expanded levels of occupation are manifest in the archaeological record by concomitant increases in certain classes of artifacts including time sensitive projectile points.

The data recovered during the course of archaeological investigations along the Bear Mountain Segment conforms to the model above (Table 6). As can be seen, little dated material exists that predates the Canebrake Phase (1200 B.C. - A.D. 600), indicating little aboriginal use of the area. During each subsequent phase, the quantity of time-sensitive projectile points increases. This would suggest increasing levels of upland occupation and the inferred corollary: greater reliance on pinyon procurement.

Many factors, including prehistoric changes in technology (e.g. the transition from atlatl to bow and arrow), reworking of more ancient point forms, as well as modern site vandalism can also affect the relative frequency of projectile points in a given area. As an independent check on these potential biases, 61 source specific obsidian dates were obtained from <u>unmodified flakes</u> from most excavation levels of all test units excavated during the current research effort. The results are contained in Tables 5 and 7.

As with the projectile point frequencies, there is very little evidence for occupation during the Lamont Phase. Substantial evidence for occupation begins in the Canebrake Phase and quickly increases. A decrease in rim values of less than 1.0 microns is more apparent than real and may simply be the result of the researchers being unable to read values of this small size range.

Regional Considerations

Information available for a number of localities within upland regions of the southern Sierra Nevada indicate a surprising contemporaneity for the initiation of aboriginal use of this area. Land use practices of substantial proportion appear to initiate during the first millenia B.C.

Perhaps this is most strikingly demonstrated with the advent of substantial aboriginal occupation of upland pinyon areas that rim the eastern

Table 6

Frequency Representation of Time-Sensitive Projectile Points

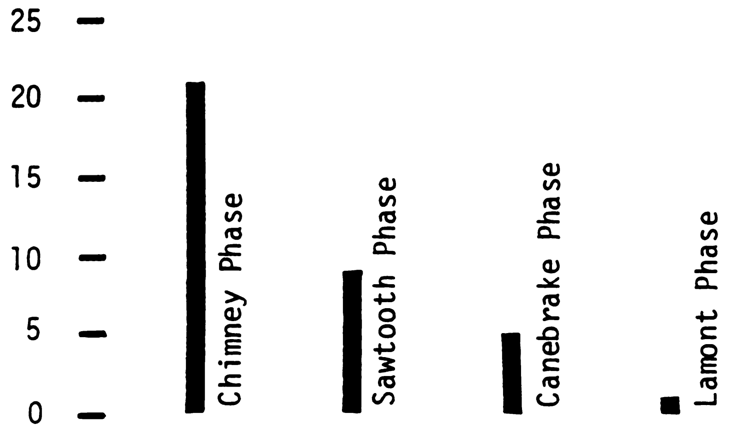
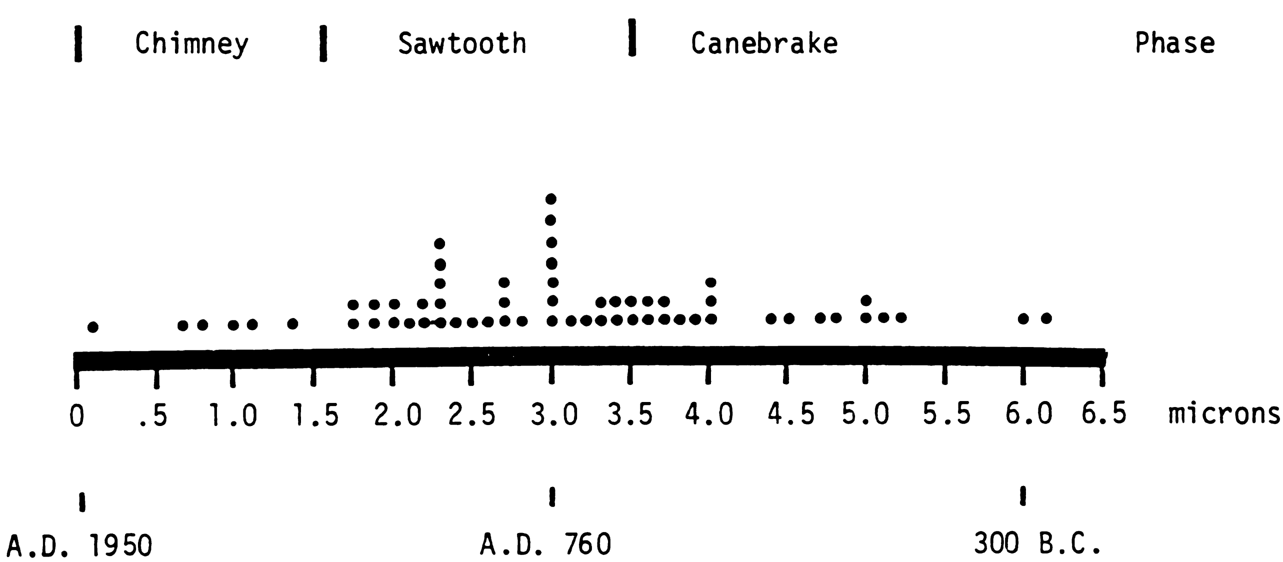


Table 7

Source Specific Obsidian Dates Obtained from Unmodified Flakes



scarp of the southern Sierra Nevada. In addition to the current research effort, three additional archaeological studies provide data pertinent to land use patterns in southern Sierra Nevada pinyon areas. These include studies by Garfinkel et al. (1979) along the Pacific Crest Trail in the Walker Pass vicinity, Robert Bettinger (1975) in the Owens Valley, and Emma Lou Davis (1964) in Mono Basin. These three reports provide information concerning the frequencies of 123 phase-marker projectile points found in pinyon-juniper woodland. These data are represented in Table 8.

As can be seen, there is very minimal representation in the period extending from 4000 B.C. to 1200 B.C. The frequency of phase-markers dating from 1200 B.C. to A.D. 600 increases significantly indicating the first major occupations of these areas. With some minor deviations the number of time-sensitive projectile points increases through each successive phase up to the ethnographic period in much the same pattern as the results obtained from investigations along the Bear Mountain Segment of the Pacific Crest Trail.

Building on the arguments presented in the preceding pages, it would appear that inception of systematic pinyon exploitation began in the first millenia B.C. and proceeded to intensify during each successive phase up to the ethnographic present. Further, this pattern is regional in nature, encompassing upland areas of the entire southern Sierra Nevada vicinity.

While emphasis thus far has been directed at the occupation of pinyon areas, it may well be that the record of prehistoric occupation of the entire southern Sierra Nevada follows much the same pattern.

Investigations at Yosemite National Park (Bennyhoff 1956; Fitzwater 1962, 1964, 1968) provides a rather complete picture of the culture history of this area. The Crane Flat Phase dates the earliest substantial use in the area and is supported by two radiocarbon dates of 1580 ± 80 B.P. and 2040 ± 100 B.P. Sierra Concave Base and Elko series projectile points are diagnostic of this early period.

Archaeological investigations at Buchanan Reservoir, situated on the Chowchilla River on the western side of the Sierra Nevada Mountains, (Moratto 1972), revealed a cultural sequence closely paralleling that found in Yosemite. Moratto's work suggests that settlement began some 2800 years ago but was sporadic until about 1700 years ago when a substantial population enclave began to occupy the area.

For both the Yosemite and Buchanan areas as well as pinyon areas of the eastern side of the Sierra Nevada, significant levels of occupation generally began in the first millenia B.C.

The evidence presented thus far would argue persuasively that during the first millenia B.C. there began an intensification of aboriginal use of upland pinyon areas on the eastern side of the southern Sierra Nevada. This trend may have also existed in the foothill and montane areas on the southwestern slopes of the southern Sierra as well. Although the evidence is far from conclusive, it appears that this change (at least on the eastern scarp of the Sierra) involved a gradual transition from a predominant but sporadic hunting regimen into a subsistence-settlement pattern emphasizing the exploitation of pinyon.

Why such a change should have occurred has recently received attention by several researchers (Moratto et al. 1979). Moratto and his associates, using what they call "coincidences of environmental and cultural changes," suggest that the onset of cool/wet conditions that characterize

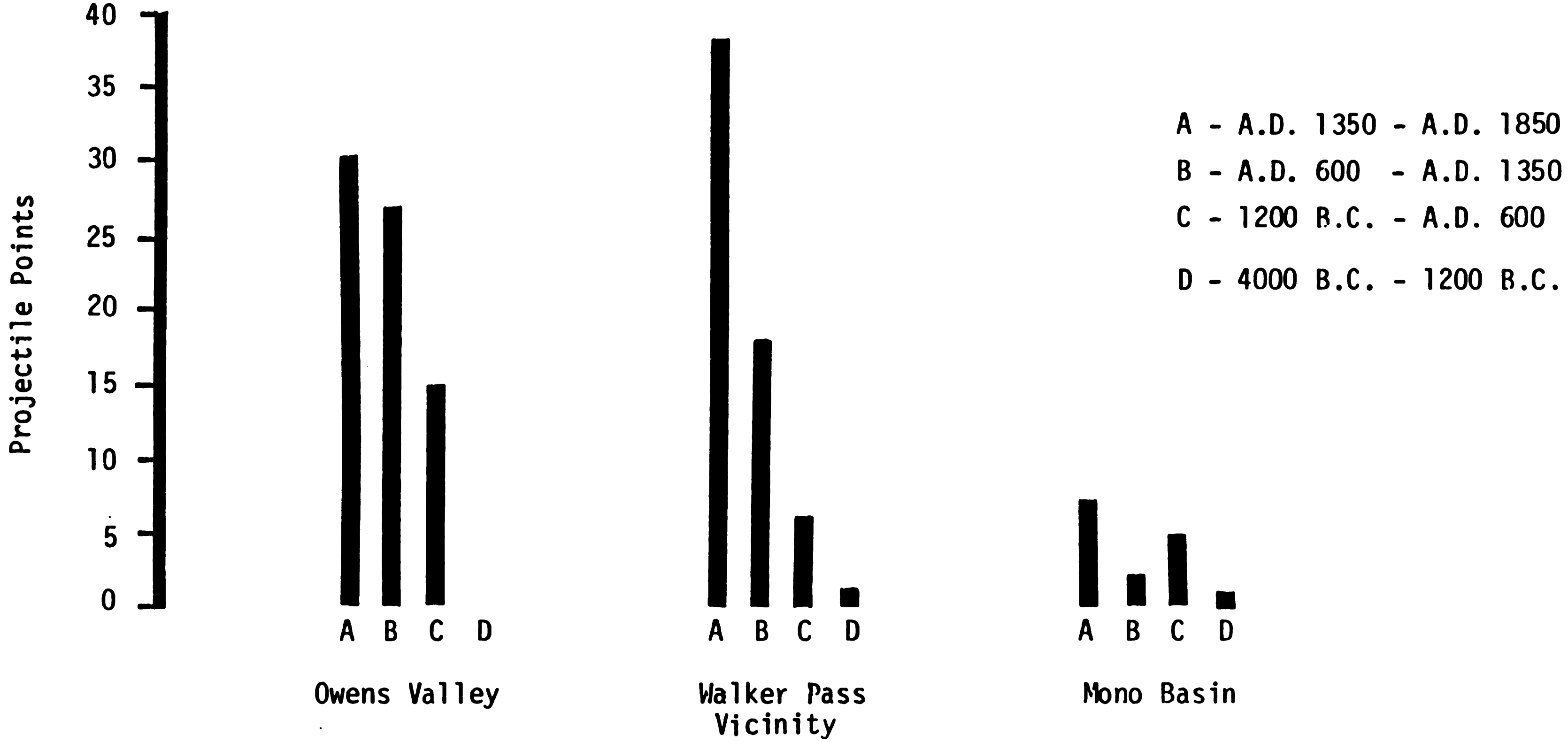


Table 8

Time-Sensitive Projectile Points Recovered from Pinyon Areas of Central Eastern California

the Medithermal climatic period (Antevs 1952) somehow were causal in initiating a rapid increase in upland occupation of the southern Sierra Nevada. As to how changes in climate are translated into changes in subsistence-settlement practices and cultural patterns, Moratto and his associates provide no clues.

This criticism aside, Moratto and his associates have thoughtfully summarized the corpus of literature pertaining to Holocene climatic change in the Sierra Nevada region (see Antevs 1952; La Marche 1973; Butler 1976; Currey 1969; King 1976; Davis, Elston, and Townesend 1976; Adam 1967; Mehringer 1977; Busby et al. 1979). In general these studies indicate that a somewhat cooler and moister climatic regime prevailed after 3000-1500 B.C., continuing into modern times (although a considerable degree of fluctuation is evident within this period).

Of major importance is the effect of the changing conditions of the Medithermal climatic period on the biotic communities of the southern Sierra Nevada and the inferred concommitant effect on prehistoric subsistence-settlement adaptation. In this regard La Marche (1973) reports that within the White Mountains of central eastern California the lower treeline for bristlecone pine has dropped approximately 150 m since 2200 B.C. La Marche believes this trend was the result of cooler and moister climatic conditions lending further support to Antev's concept of a Medithermal period. Nor is this pattern confined to the White Mountains. Currey (1969) notes similar changes in fossil treelines in the High Sierra and infers a downward shift in the timberline contemporaneous to that described for the White Mountains.

While changes in the areal coverage of forest vegetation at extremely high elevations in the Sierra Nevada and White Mountains may not have had a major effect on the subsistence-settlement pursuits of aboriginal populations, such changes occurring in pinyon areas at lower elevations may have been significant. In a recent summary of analyses of fossil plant assemblages occurring in ancient woodrat middens, both pinyon and juniper have been demonstrated to be particularly sensitive to paleoclimatic changes (Van Dervender and Spaulding 1979). Van Dervender and Spaulding deal primarily in the documentation of large elevational shifts of pinyon-juniper woodland during the Late Wisconsin and Early Holocene. Considering the elevational sensitivity of pinyon-juniper woodland to climatic change, it is not unreasonable to suggest that, along with the downward shifts in timberline occurring at high altitudes in the Sierra Nevada and White Mountains at 3000-1500 B.C., such shifts were also occurring in the lower limits of the pinyon-juniper zones.

Figure 7 is a graph representing the amount of land surface area above the indicated elevation for the eastern scarp of the southern Sierra Nevada. Although this graph was constructed using elevational and surface area data from a 55 sq. km. transect in the vicinity of Little Lake, California, the slope of the eastern scrap of the Sierra within the Owens Valley region is generally similar. The lower limits of pinyon-juniper woodland are now approximately 1,676 (5,500 ft) to 1829 (6000 ft), the upper margins 2346 m (7500 ft) to 2743 m (9000 ft). If it can be assumed that an effect of the cool-moist Medithermal climatic period was the lowering of the elevational ranges of certain biotic communities (e.g. bristlecone and pinyon-juniper woodlands) by as much as 150 m (see La Marche 1973), this would mean that the lower timberline elevation for

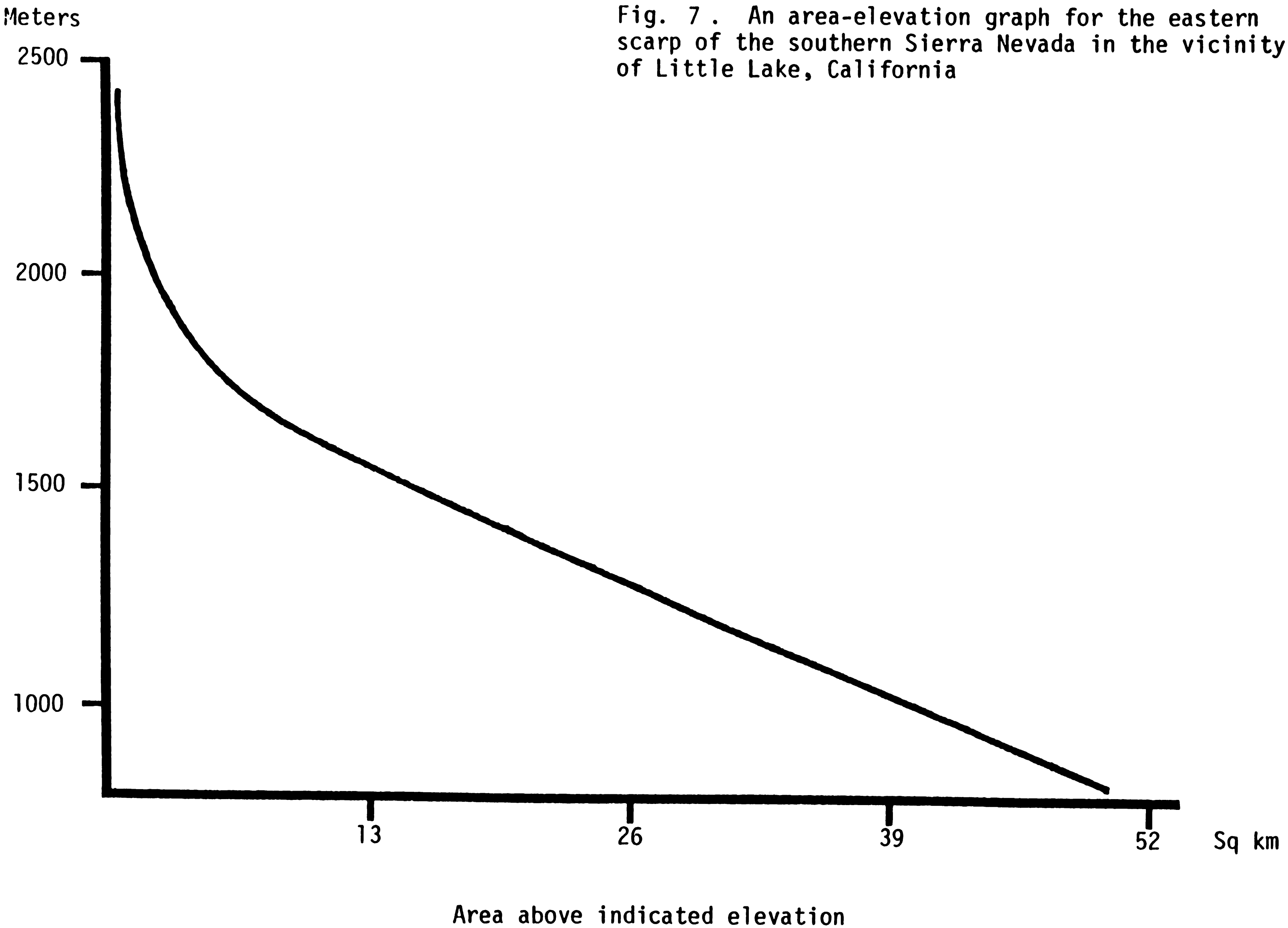


Fig. 7 . An area-elevation graph for the eastern scarp of the southern Sierra Nevada in the vicinity of Little Lake, California

pinyon-juniper woodland at the onset of the Medithermal was approximately 1829 m (6000 ft) to 1981 m (6500 ft). What is of major significance, considering the almost logrithmic character of the surface area/elevation graph, is that even a slight drop in the lower elevational limit of a montane forest community such as pinyon-juniper woodland will greatly increase the areal extent of that community (see Mehringer 1967).

Thus, at somewhere near 3000-1000 B.C. pinyon-juniper woodlands in the vicinity of central eastern California probably began to increase in areal extent. Further, if there is a correlation between pinyon nut productivity and precipitation (Bettinger 1979) it may have meant that nut crops within these expanding forests were of relatively greater yield.

During this same time period several major changes in aboriginal subsistence-settlement strategies have been noted in central-eastern California, in addition to increasing use of the pinyon-juniper zone. Robert Bettinger (1975, 1979) has suggested on the basis of his surface studies as well as some evidence from the Stahl (Harrington 1957) and Rose Spring (Lanning 1963) sites that at 1200 B.C. there was a change in emphasis from the exploitation of riparian resources to desert scrub resources within the Owens Valley. Bettinger reasoned that increasing precipitation at the onset of the Medithermal would increase productivity of desert scrub areas while increasing erosional activity would decrease the total area of riparian communities. In such a circumstance increasingly productive pinyon stands would have also served as an attractive subsistence alternative.

Several researchers have also emphasized that central-eastern California appears to exhibit an almost endemic state of population pressure over the last several thousand years of prehistory (Bettinger 1975, 1979; Garfinkel and Cook 1979; Bouey 1979). The causes of this population presure are open to speculation, but most explanations single out climatic change and immigration for creating stressful changes in the ratio of population size to carrying capacity. Population pressure would, in turn, cause populations to devise new methods of adaptation (see Cohen 1977; Bouey 1979). Thus the expansion of populations into a new ecological zone (e.g. pinyon-juniper woodland) to obtain new resources as well as the development of new technologies for these endeavors (e.g. pinyon storage, roasting, etc.) is the result of a mechanism by which populations redefine their adaptive equilibria with the environment (Cohen 1977). Under this rubric it becomes apparent that the increase in productivity of pinyon stands alone may not have been the single causal agent for the ensuing occupation of pinyon-juniper woodlands in central-eastern California. Undoubtedly, a suite of factors, including population pressure as well as changes in technology and resource zone productivity, all were responsible for prehistoric culture change in central-eastern California.

ARCHAEOLOGICAL SUPPORT FOR THE DIFFERENTIATION AND ANTIQUITY OF TÜBATULABALIC AND NUMIC SPEAKERS IN THE SOUTHERN SIERRA NEVADA

Introduction

The archaeological definition of cultural patterns coincident with linguistic boundaries is the subject for the present section. Such an objective is not a novel one, and previous studies have been made in the Great Basin and California in this regard (Taylor 1961; Gunnerson 1962; Hopkins 1965; Madsen 1975; Baumhoff and Olmsted 1963, 1964).

Such studies are important in that they can test the degree of fit between the linguistically-derived models of population movement and expansion and those models developed independently from archaeological studies.

This section presents archaeological evidence from the southern Sierra Nevada suggesting differing cultural patterns characteristic of Tübatulabal and Numic speakers. Archaeological sequences indicating the antiquity of these patterns are compared to historical linguistic evidence dating the linguistic separation of Tübatulabalic and Numic. Finally, a series of hypotheses are presented positing the factors leading to an early differentiation of these two groups.

Great Basin Linguistic Prehistory

Two branches of the Utaztecan linguistic stock are located in the southwestern Great Basin and southern Sierra Nevada areas: the Tübatulabalic and Numic families. Tübatulabal is the sole representative of the former family, while the Numic family is composed of three subdivisions containing at lease five languages and numerous dialects. The general boundary of these two linguistic stocks at the time of European contact was the Crest of Sierra Nevada in the vicinity of Walker Pass (Map 3) (Zigmond 1938; Voegelin 1938; Grosscup 1977).

Linguists have at varying times attempted to trace the origin spread and distribution of these languages through a variety of techniques including comparative reconstruction, lexicostatistical dating, and geographical discontinuities (Fowler 1972; Hale 1958-1959; Lamb 1958; Miller, Tanner and Foley 1971).

Linguists appear to be in general agreement concerning the time of separation for the two families of concern to the present study. Hale (1958-1959) places this division in the area of 2,500 years before present and in a recent review of Great Basin linguistic prehistory James Goss (1977) suggests a guess chronology for this event in the area of 2,000 B.C. Sidney Lamb (1958) cites lexicostatistical figures by Swadesh which suggest a split of these two families in the area of 3,000 to 4,000 years ago. In this regard Lamb (1958) states:

> "During the second millenium B.C. Numic was becoming distinct from Tübatulabalic. The present location of Tübatulabal speakers may well be the same as that occupied by their linguistic ancestors of three thousand years ago...

> The original Numic dialects may have occupied an area which could have included the historical territory of the Kawaiisu as well as the country just east of that part of the Sierra Nevada now assigned to the Tübatulabal."

Fowler (1972), using the method of comparative linguistics, reconstructs the homeland for Numic speakers using plant and animal terms common to the various Shoshonean languages. She places the homeland for Numic speakers in the area of the southern Sierra Nevada and western Mojave Desert within the ethnographic territories of the Tübatulabal and Kawaiisu and within the general area of concern to the present study. The area identified is similar but slightly to the west of that suggested previously by Lamb (1958).

It appears that the area where Numic and Tübatulabalic peoples became linguistically distinct was either in or very near the southern Sierra Nevada.

Environment

This area postulated as the homeland of the Numic and Tübatulabalic peoples is bisected by the crest of the Sierra Nevada. To the west lies the well watered drainages of the Kern River. This environmental province is characterized by stands of oak and digger pine at lower elevations and pinyon-juniper woodland at relatively higher elevation. In addition, small pockets of Jeffrey pine are found on the higher mountain ridges (see chapter on Environment).

Owing to the rain shadow effect of the Sierra Nevada the area east of the Sierra Nevada Crest, including Indian Wells Valley and other portions of the northern Mojave Desert, is abruptly more arid. This aridity translates into plant communities of predominately Creosote Brush Scrub and Shadscale Scrub.

This environmental diversity represented in a relatively small geographic area had significant effects upon prehistoric cultural patterns. According to Stephen Jett (1977);

> "...[such conditions] permit societies to inhabit smaller territories, be less migratory, and to have less need for intergroup cooperative hunts as compard to groups in the far less productive environments to the northwest, where lower population densities, larger territories, and more movement was required. The economies of the California groups west of the Owens Valley and the Mojave Desert were essentially Californian, not desert (Kroeber 1939). Further physiographic barriers such as the eastern Mojave Desert and the eastern front of the Sierra Nevada undoubtedly fostered isolation between California and points eastward. These several factors would encourage linguistic differentiation in Southern California, yielding smaller linguistic territories with sharper boundaries."

More specifically, Catherine Fowler and Sydney Lamb have suggested that the Sierra Nevada crest formed a relatively sharp boundary between pre-

historic Numic populations occupying the eastern flanks of the Sierra Nevada and western Mojave, and Tübatulabalic populations whose homeland was the Kern River drainage on the west side of the Sierra Nevada.

Archaeological Data

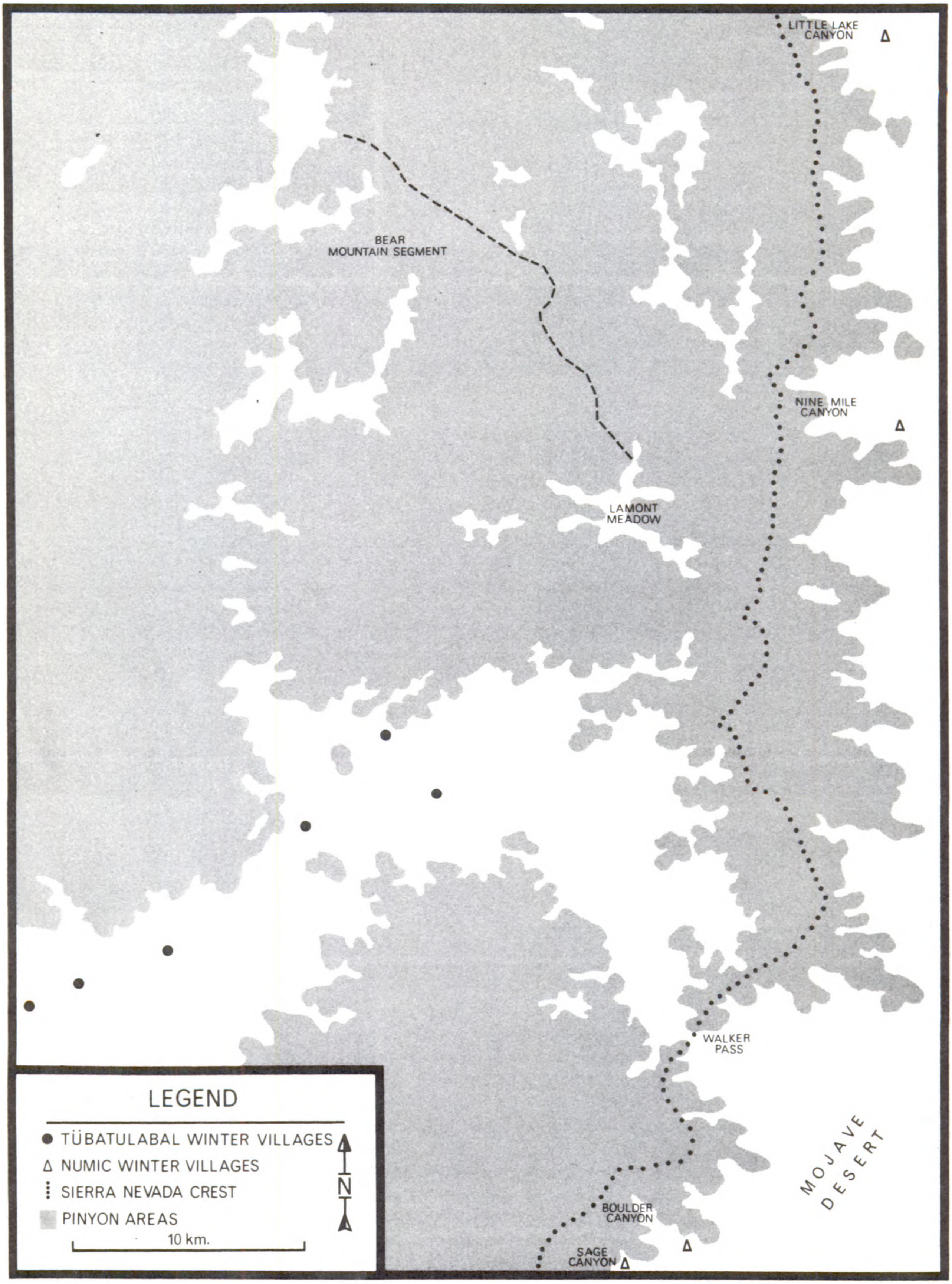
Combining the archaeological data from the present study as well as that from the Lamont Meadow and Morris Peak Pacific Crest Trail segments (Garfinkel, et al. 1979), it is possible to identify the differing archaeological patterns of Tübatulabalic and Numic speakers. Because of the nature of the archaeological testing programs, most of this information is derived from areas on or adjacent to the Sierra Nevada crest, although some information is available from surrounding areas as well.

Settlement Pattern

Winter village locations for the Tübatulabal were in the South Fork Valley near the Kern River. Ethnographic information indicates such areas as preferred locations and archaeological sites in the valley have been identified as such (Voegelin 1938; Salzman 1977; Cawley n.d.). Specific Tübatulabal winter village locations are shown on Map 4. Winter villages for Numic speakers, the Panamint Shoshone and Kawaiisu, were located, in part, in the desert canyons at the eastern foot of the Sierra Nevada near a perennial source of water and within range of winter food resources (Steward 1938; Hanks and Garfinkel 1976; Wildesen 1974; Garfinkel et al. 1979). As can be seen on Map 4 the Sierra Nevada crest separates the winter settlement areas of the Tübatulabal from those of the Numic speakers.

The relationship of these two winter village areas to pinyon resources is of prime importance in the identification of the less permanent sites located in the southern Sierra Nevada and identified during archaeological investigations along the Pacific Crest Trail. This sample includes 12 sites located directly on the precipitous ridges and saddles of the Sierra Nevada crest immediately north of Walker Pass as well as 22 additional sites located to the west in the Bear Mountain and Lamont Meadow areas.

Using a principle of distance minimization in relationship to the procurement of resources, Numic groups would have most heavily exploited the pinyon stands directly west of their winter villages along the Sierra Nevada crest. Rather than scale the steep ridges of the Sierra Nevada crest, the Tübatulabal would have been content to concentrate their efforts in the vast and easily accessible pinyon areas to the north of their winter villages including the Lamont Meadow and Bear Mountain areas. Thus, while the Sierra Nevada crest forms the boundary between prehistoric winter village locations of both groups it may also have had the same effect on more ephemeral settlement-subsistence activities as well. Several archaeological data sets tend to substantiate this view and are discussed below.



Map 4. Tübatulabal and Numic winter village locations.

Flaked Stone Material

Although a sample size of 34 sites is relatively small, there exists a division in flaked stone material preference exhibited between the Tübatulabal and Numic speakers. This division is manifest in the ratio of chalcedony to obsidian flaked stone debitage and artifacts. Sites located along the Sierra crest generally possess larger quantities of chalcedony and would be hypothesized as areas used by Numic speakers. More specifically, 5% to 75% by weight of the flaked stone material found at the Sierra Nevada crest sites is of chalcedony material, while this ratio rarely exceeds 5% at sites located in the Bear Mountain and Lamont Meadow vicinity, the remainder consisting almost exclusively of obsidian. This dichotomy in flaked stone material is represented in Table 9.

Sources for both obsidian and chalcedony both exist in the desert. Almost all obsidian flaked stone material recovered from the southern Sierra Nevada has been chemically analyzed and indicates a source in the Coso range which lies 25-40 km northeast of the study area. To the southeast, 25-50 km from the study area in the El Paso Mountains, are located agate and chalcedony quarries (Davis 1978). Visual examination of chalcedony flaked stone material from the study area suggests a close similarity to the El Paso Mountains chalcedony.

Both raw materials were easily accessible, located approximately equidistant from the study area, yet there appears to be a greater preference for chalcedony from the Sierra crest sites. The reasons for this preference do not appear to relate to availability of stone resources nor the functional characteristics of these raw materials (the ethnolinguistic groups in question occupied a similar pinyon-juniper woodland and possessed a similar technology).

Several ethnographic accounts indicate a strong social identification with the use of a particular raw material for flaked stone manufacture (c.f. True 1966). Indeed, True uses frequency representation of various classes of flaked-stone raw material as one of several means to separate the archaeological manifestations of the Luiseno and Diegueno ethnolinguistic groups.

The differences exhibited in representation of certain flaked stone material within the study area is suggested to be evidence for different ethnolinguistic groupings.

There is no attempt here to claim that an increased preference of chalcedony was a pan-Numic phenomena. In all probability this pattern was extremely localized possibly the result of a prehistoric social group that habitually occupied the southern Indian Wells Valley and El Paso Mountains area. A good candidate for this local group would be the Kawaiisu or a sub-branch thereof.

Ground Stone Artifacts

At four of the seven sites investigated along the Sierra Nevada crest there were several items of milling equipment made of stone only available from desert areas to the east. This assemblage includes stone bowl fragments, manos, and a pestle which were manufactured from volcanics

Table 9

Percentage of Obsidian and Chalcedony Flaked Stone Material From Sites Located Along the Pacific Crest Trail[1]

Sierra Crest Sites	Wt.Obs. (gms.)	Wt.Chal.	Total	% Obs.	% Chal.
PCT-1	8.2	0	8.2	100	0
PCT-2	12.8	34.6	47.4	27.0	73.0
PCT-3	35.2	30.4	65.6	53.7	46.3
PCT-4	100.9	280.3	381.2	26.5	73.5
PCT-12	316.2	19.6	335.8	94.2	5.8
PCT-13	335.1	88.2	423.3	79.2	20.8
PCT-14	528.7	11.1	539.8	97.9	2.1
Lamont Meadow and Bear Mountain Sites					
PCT-15	172.8	3.3	176.1	98.1	1.9
PCT-16	41.7	2.1	43.8	95.2	4.8
PCT-17	284.7	11.1	295.1	96.2	3.8
PCT-18	83.9	0	83.9	100	0
PCT-19	167.2	0	167.2	100	0
PCT-20	348.5	6.4	354.9	98.2	1.8
PCT-21	11.1	0	11.1	100	0
KR-39	3311	152.2	3463.2	95.6	4.4
KR-41	3794.6	40.5	3835.1	98.9	1.1
KR-42	2018	63	2081	97.0	3.0
KR-43	323.3	7.2	330.5	97.8	2.2
KR-44	1253.9	37.3	1291.2	97.1	2.9
KR-46	826.2	10.8	837	98.7	1.3
KR-48	401	15.4	416.4	96.3	3.7
KR-49	692.5	.5	693	99.9	0.1
KR-50	169.2	.1	169.3	99.9	0.1
KR-53	736.2	2.5	738.7	99.7	0.3
KR-57	2349.2	115.6	2464.8	95.3	4.7
KR-60	199.9	41.7	241.6	82.7	17.3*
KR-64	838.7	4.6	843.3	99.5	0.5
KR-71	177.5	0	177.5	100	0
KR-73	30	0	30.0	100	0

[1]Only formalized tools, modified flakes, and unmodified flakes were included. Core fragments, because of their large size, were not included in this analysis. Sites labeled "PCT" are reported by Garfinkel et. al (1979) and constitute surface assemblages only. Sites from the Bear Mountain Segment represent the total site assemblage.

*Only two large chalcedony flakes were obtained from this site.

including basalt, andesite, and scoria. In addition, a single bowl fragment manufactured from a sedimentary sandstone material which is also thought to be of desert origin was recovered. In contrast, the 22 sites investigated to the west of the Sierra Nevada crest did not yield a single specimen of ground stone manufactured from a non-local material. In these sites ground stone was generally manufactured from local granite which forms much of the geological structure of the southern Sierra Nevada. This patterning in ground stone assemblages suggests that the pinyon areas along the Sierra Nevada crest were habitually utilized by Great Basin oriented populations, including Numic speaking groups.

Rock Art

Examples of rock art found in the southern Sierra Nevada and vicinity provide further evidence for an archaeological distinction between the two linguistic entities.

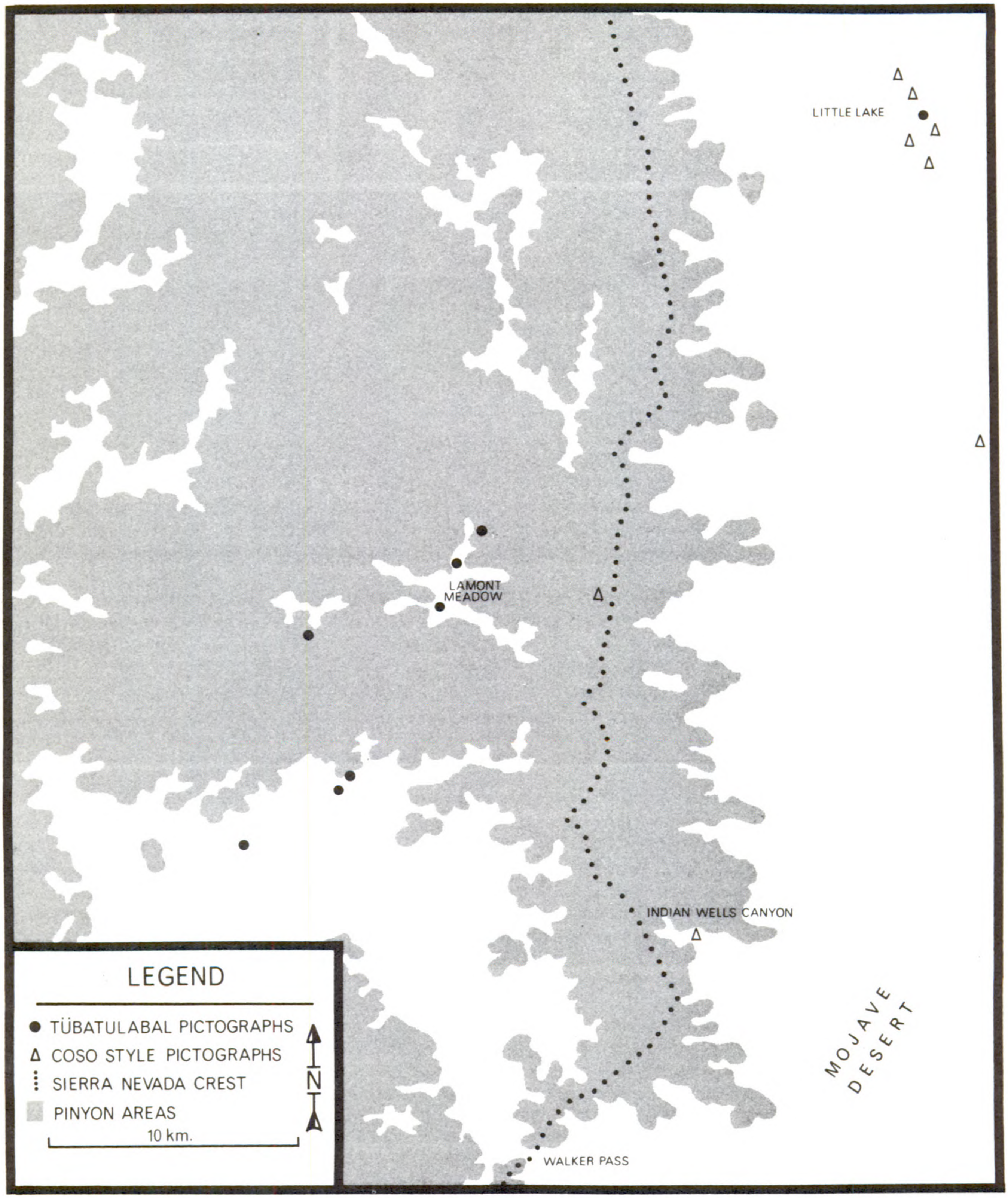
Rock art of the Tübatulabal has been previously characterized (Andrews 1977a, b, 1979). Diagnostic features are the production of pictographs of abstract forms with representational elements in the minority and zoomorphs almost always being absent. In contrast, rock art for most peoples in the Great Basin is in the form of petroglyphs: styles vary but nearby a peculiarly unique regional variant is found within the Coso Range. Hallmarks of this rock art are the depiction of stylized bighorn sheep with front-facing horns with boat-shaped and patterned bodies (Grant *et al.* 1968).

Just below the crest of the Sierra Nevada, both east and west of the temporary pinyon stations identified during archaeological investigations, are found pictographs with elements quite similar to those found within the Coso Range (Garfinkel 1979). Of particular interest is the presence of stylized bighorn sheep in several instances drawn in a manner quite similar to that found for Coso Range petroglyphs. Rock art sites identified at distance greater than .5 km to the west of the Sierra Nevada crest have conformed to the Tübatulabal pattern. Very few sites have been located in the desert area to the east which could be identified as Tübatulabal, and, in turn, only one site has been recorded which could be identified as the work of desert peoples (Numic speakers) within the area of the south fork drainage of the Kern River.

Cultural Sequence

Several lines of evidence have been used to demonstrate the spatial discontinuity between the archaeological manifestations of Tübatulabal and Numic speaking groups. Unfortunately, the ability to date these patterns is severely limited by the lack of systematic archaeological investigations within the heartland of the ethnographic territories for the Tübatulabal and the Little Lake Shoshone/Kawaiisu. Nonetheless, certain divergent data sets suggest a tentative temporal sequence for the appearance and development of these two groups.

As stated previously, the work of linguists indicates that the division of Tübatulabalic and Numic occurred 2,000 to 3,000 years ago in the vicinity of the present study area. This corresponds closely with



Map 5. Tübatulabal and Coso style rock art locations.

the first dated archaeological evidence (Canebrake Phase) of pinyon base camps and temporary pinyon stations within the territory of the ethnographic Tübatulabal. Further, the structure and placement of these pinyon camps is essentially identical to the pinyon settlements described ethnographically for the Tübatulabal (Voegelin 1938) (see Prehistoric Land Use Patterns of Upland Pinyon Areas of the Southern Sierra Nevada). This continuity of the archaeological record from approximately the first millenia B.C. up to the ethnographic present, coupled with the derived lexico-statistical information on the Tübatulabal, argues for an in-place development of Tübatulabal groups.

Linguistic data also suggests that Numic groups have inhabited the western Great Basin on the eastern side of the Sierra Nevada for 2,500 t0 4,000 years (Hale 1958-9, Lamb 1958, Fowler 1972). Although independent archaeological confirmation is limited, some support of the above is suggested by the dating of the Coso rock art style (Grant et al. 1968). Grant and his associates suggest that rock art found within the Coso Range, 25-40 kilometers northwest of the study area, was the product of Numic speaking peoples. Further, Grant claims that this style was in use from approximately 1000 B.C. to A.D. 1000. This lengthy time span, as well as the relatively localized nature of the Coso style tradition, would suggest an in-place development of Numic groups lasting several millenia.

Additional evidence for an in place development of Numic populations comes from the Rose Spring site (Inyo-392) located north of Little Lake some 15 km from the study area. Five cultural phases were identified by Lanning (1963) based on diagnostic projectile point forms and radiocarbon determinations (Clewlow, Heizer, and Berger 1970). The sequence spans a period from 1950 B.C. up to the proto-historic period. Most artifact types within the assemblage show little change through time. Projectile point types change through time but this change is gradual without discontinuities. In addition, no stratigraphic discontinuities that would be indicative of major settlement disruptions, were noted in the subsurface deposits. From this it can be inferred that only one or a few closely related groups made use of the Rose Spring site.

Discussion

What is most striking is the degree of correspondence between archaeological data and the linguistic models developed for this area of the Great Basin and southern Sierra Nevada. Essentially, linguistic differentiation of Tübatulabal and Numic closely parallels an observed differentiation in material culture and subsistence-settlement pattern. Linguistic analyses (Lamb 1958; Fowler 1972) suggested that the locus of differentiation was in the general area of the southern Sierra Nevada and western Great Basin. Archaeological data not only tends to confirm this but is more specific as to the prehistoric boundary of these developing language groups: the crest of the Sierra Nevada in the vicinity of Walker Pass.

Lexico-statistical data places the differentiation of Tübatulabal and Numic speakers at approximately 2-4,000 years before present (Lamb 1958; Hale 1958; Goss 1977). During this same time span the archaeological record provides the first discernible, albeit tenuous, manifestations

of a separate Tübatulabal and Numic cultural pattern, adding further credance to the lexico-statistical data.

If one can assert from the previously presented data that two linguistically distinct peoples occupied the area of the southern Sierra Nevada - Western Mojave Desert region since a remote time in the past, then one may question the reasons for such a development.

Goss (1977) argues that linguistic diversity, as is present in the general area of the southwestern Great Basin and the southern Sierra Nevada, may best be explained as a function of isolation from ongoing communication. Stephen Jett (1977) further indicates that since groups inhabiting the southwestern Great Basin had economies unlike the more typical desert-based groups these differences would foster isolation. Also, Jett notes certain physiographic barriers would have fostered these linguistic differences. The eastern Mojave Desert, an expansive and remote area, as well as the eastern front of the Sierra Nevada range provide physical barriers to easy interchange.

Hence, territories more rich in resources, slightly different in economic basis, and separated from wider areas by geographical barriers might have precipitated the distinctive linguistic differentiation characterizing the area.

PREHISTORIC LAND USE PATTERNS OF UPLAND PINYON AREAS OF THE SOUTHERN SIERRA NEVADA

The 15 archaeological sites located along the Bear Mountain Segment of the Pacific Crest Trail was variable in size, environmental context, and surface and subsurface constituents. However, similarities do exist in the frequency and classes of certain artifact and feature categories represented at particular sites. These similarities, together with the inferred activity sets they represent, are the basis by which major settlement types are defined. Within the pinyon areas of the southern Sierra Nevada several settlement types are distinguished and are interrelated in such a way as to form an integrated regional system of upland pinyon exploitation.

The purpose of this chapter is then: (1) to synthesize the data available from archaeological investigations along the Bear Mountain Segment in an attempt to identify relevant subsistence-settlement types, and (2) to elucidate the articulations and inter-relationships of these subsistence-settlement types in terms of a generalized prehistoric land use strategy for upland pinyon areas of the southern Sierra Nevada Mountains.

A Subsistence-Settlement Site Typology for Pinyon Areas of the Southern Sierra Nevada

Systematic archaeological investigations along the Lamont Meadow, Morris Peak, and Bear Mountain trail segments have resulted in the surface and subsurface testing of 34 sites. These sites are all located within pinyon-juniper woodland and span an elevational transect of approximately 750 m. It is assumed that these 34 sites provide a representative range of prehistoric subsistence-settlement activities occurring within pinyon-juniper woodlands of this region of the southern Sierra Nevada.

During the course of these investigations three subsistence-settlement types were distinguished: pinyon base camps, temporary pinyon stations, and temporary hunting camps. Although these intuitive types were derived from both surface and subsurface data it appears that, often, the presence or absence of certain surface manifestations (e.g. midden, rock ring features, bedrock milling equipment, etc.) provides enough information for adequate categorization.

In order to achieve greater reliability in determining subsistence-settlement types, a variety of computer-assisted discriminant analyses (BMDP7M - Stepwise Discriminant Analysis) (C.F. Brown 1977) were conducted on site surface variables from these 34 sites. Discriminant analysis attempts to reproduce intuitively derived groups using the variables that characterize the differences between those groups. Discriminant analysis has been used advantageously by Robert Bettinger (1977) in developing archaeological site taxonomies for central-eastern California. Bettinger (1977:18) has stated; "...given the intuitive type for each site and the variables used in the intuitive typing, the program produces a classification system essentially equivalent to the intuitive typing, indicating that the original typology was internally consistent." Results from our study indicate that discriminant analysis could replicate our intuitive

typology with approximately 89% accuracy indicating our original typology was internally consistent. In those cases where there was disagreement, our own intuitive types were fairly uncertain.

Six variables manifesting surface characteristics of the sites in question were used in the discriminant analysis. These variables included a presence/absence determination of: projectile points, bedrock milling equipment, portable milling equipment, rock ring features and midden. In addition, a division of site size between those greater than 8000 sq m and those smaller was employed as a variable. These variables were used to discriminate three site types: pinyon base camps, temporary pinyon stations, and temporary hunting camps.

Pinyon base camps were used by large population aggregates or perhaps whole villages and were inhabited for an extended period of time in summer and fall. They served as areas for habitation as well as a base for hunting and gathering activities for an area several kilometers distant. These sites were generally situated near a permanent water source and at lower elevations.

Temporary pinyon stations were utilized by small groups; often no more than a single family for only brief periods of time while harvesting, roasting, and possiblycaching pinyon nuts. Some ancillary hunting activity may have also occurred at these sites. These sites are generally small (2000-8000 sq m), centrally located within upland pinyon groves, and are usually not associated with a source of water.

Temporary hunting camps were sites utilized by one-to-three male hunters for the procurement and preparation of animal resources, brief occupation, and the production of hunting implements. These sites are found in a variety of situations but usually incorporate an expansive view of the surrounding countryside.

The BMDP7M Stepwise Discriminant Analysis results in a table of classification coefficients (Table 10). Each potential site type receives a value for each variable present. Scores for each variable are then summed for potential site types and a constant subtracted. The site is classified for the type for which it receives the highest score. The fifteen sites located along the Bear Mountain Segment were classified by this analysis resulting in the following subsistence-settlement site types:

	Pinyon Base Camp	Temporary Pinyon Station	Temporary Hunting Camp
KR-39	+		
KR-41	+		
KR-42		+	
KR-43			+
KR-44		+	
KR-46		+	
KR-48			+
KR-49			+
KR-50			+
KR-53			+
KR-57	+		
KR-60		+	
KR-64		+	
KR-71			+
KR-73		+	

Table 10

Classification Coefficients for Subsistence-Settlement Site Typology

	Pinyon Base Camp	Temporary Pinyon Station	Temporary Hunting Camp
Projectile Points	-1.2	.9	3.9
Bedrock Milling Equipment	8.1	3.0	0.0
Portable Milling Equipment	6.7	6.7	-1.0
Midden	8.3	5.2	2.1
Rock Ring Features	3.8	3.7	-1.6
Site Size $\geq$ 8000 sq. m.	13.8	4.5	-1.9
Constant	-17.1	-8.4	-2.7

Not unexpectedly, other data sets (e.g. environmental context, subsurface information, etc.) tend to corroborate the results obtained from the discriminant analysis. A discussion of each functional site type and its relationship to other relevant data is presented below. Much of this information has been presented and discussed in the site descriptions, and will only briefly be summarized.

Pinyon Base Camps

The discriminant analysis designated KR-39, -41, and -57 as pinyon base camps. These designations were primarily based on the presence of a large site surface area ($\geq$ 8000 sq m), midden, as well as portable and bedrock milling equipment. These characteristics are consistant with the fact that pinyon base camps functioned as centers for hunting and gathering activities as well as habitation areas for large population aggregates for periods of several months.

The elaboration of subsistence activities is primarily indicated by the numbers and diversity of subsurface food remains. KR-39 and -41 were the only sites which yielded significant faunal assemblages. This faunal inventory included both large and small mammals. Not surprisingly KR-39, -41, and -57 yielded abundant direct evidence of pinyon exploitation with the recovery of a quantity of charred pinyon seed coats and cone remains. Significantly, KR-39 and -41 also possessed a quantity of charred digger pine cone and seed remains. Digger pine nuts, along with being exploited in autumn, also were available during early summer (Rhode 1979). This suggests that pinyon base camps may have been occupied as early as July.

The relative diversity of subsistence activities is also reflected in the technological assemblages at these pinyon base camps. A major reliance on the procurement and processing of vegetal foods is reflected in the elaborate ground stone assemblages found on the surface of KR-39, -41, and -57 (see Ground Stone Section). A number of mano, pestle, and metate specimens and fragments found in the subsurface deposits of these sites further corroborates the importance of vegetal resources. In this regard, KR-39 contained several large core tools that appear to have been used in a shredding or pounding capacity undoubtedly in an effort to process highly fiberous vegetal material (see Flaked Stone Analysis).

Perhaps the most striking aspect of the subsurface deposits at KR-39, -41, and -57 was the vast amount of flaked stone debitage encountered in subsurface deposits. Significant amounts of modified flakes and modified tools were also recovered. The extreme quantity as well as variable size characteristics of the debitage suggests that a full range of manufacturing procedures (e.g. primary and secondary reduction as well as retouch) was occurring at these sites. An analysis of modified flakes revealed a wide range of edge angles and damage intensities suggesting a wide range of functional uses (e.g. cutting, scraping, etc.) (see Flaked Stone Analysis).

The habitational aspects of pinyon base camps are not only reflected in their substantial midden development, but by the quantity of subsurface artifacts not directly attributable to subsistence. For instance, a number of quartz crystals and red ocher nodules were recovered from KR-39 and KR-41. These artifacts suggest activities associated with ceremonial practices (see Site Descriptions). In addition, the recovery of a number of beads and several pendents further indicate that these pinyon base camps were loci of relatively lengthy occupation.

Temporary Pinyon Stations

The discriminant analysis designated KR-42, -44, -46, -60, -64, and -73 as temporary pinyon stations. These designations were primarily influenced by the presence of portable and/or bedrock milling equipment, midden, and rock ring features. KR-43 was intuitively classified as a temporary pinyon station although the discriminant analysis provisionally typed this site as a temporary hunting camp. Essentially identical to several other temporary pinyon stations possessing rock ring features, small surface areas, and midden, KR-43 lacked portable and bedrock milling equipment which was enough to alter its functional designation.

In general, surface and subsurface constituents of these sites exhibit characteristics heavily weighted toward a single subsistence activity: pinyon exploitation. This is most obviously manifested by the presence of rock ring features (generally inferred to have functioned as pinyon caches or as temporary structures--see Rock Ring Features section) as well as portable and/or bedrock milling equipment.

More direct evidence of pinyon exploitation is indicated by the recovery of a number of charred pinyon seed coats and cone remains from the subsurface deposits of these sites. Unlike pinyon base camps, the charred plant remains species inventory is almost exclusively pinyon (although several small fragments of digger pine seed and cone fragments were recovered from KR-60).

Of interest are the surprising depths of midden development that often occur at temporary pinyon stations. These deposits are almost completely devoid of faunal material and lack much of the habitational indicators mentioned in the context of pinyon base camps. It is inferred that this midden development is primarily the result of the roasting and burning process involved in pinyon preparation (see Voegelin 1938). Large game, if it was procured during the pinyon harvest, was transported back to and consumed at pinyon base camps, thereby providing for more equitable distribution of animal resources among larger population aggregates.

Not unexpectedly, surface flaked stone scatters as well as subsurface deposits possessed a relatively low density of debitage which would indicate that stone tool manufacture involving secondary reduction and retouch was of minor importance at these sites. Hunting related activities were not totally absent at temporary pinyon stations, however, as evidenced by the number of projectile points recovered, as well as a high ratio of utilized flakes to debitage. Undoubtedly, hunting implements were being transported into these sites or, occasionally, being manufactured on the spot for immediate use.

Temporary Hunting Camps

The discriminant analysis designated KR-43, -48, -50, -53, and -71 as temporary hunting camps. In general, these sites are relatively small flaked stone scatters possessing little else in the way of other surface cultural constituents. (The one exception is KR-43 which possessed a rock ring feature. As previously mentioned, this site shares characteristics of both temporary pinyon stations and temporary hunting camps).

Not surprisingly the cultural assemblage at these sites is restricted to projectile points, bifacial tools, modified flakes, and debitage. Owing to the sporadic nature of occupation, most of the temporary hunting camps lacked significant midden development. However, KR-50 and KR-71 did possess small areas of midden deposit uniformly shallow in depth. Cultural manifestations within these deposits were restricted to a very small amount of flaked stone material as well as several charred pinyon seed parts and cone remains. These middens may have been the result of camping fires and the occasional roasting of locally available pinyon by hunting parties who frequented these sites. The total lack of vegetal processing equipment would suggest that the exploitation of pinyon, if it was occurring at all, was certainly unsystematic and served only as a tertiary subsistence activity.

The Subsistence-Settlement Pattern

The definition and elucidation of the relationships between the derived functional site types in terms of an overall prehistoric land use strategy for those upland pinyon areas of the southern Sierra Nevada occupied by the ethnographic Tübatulabal shall be attempted by using both ethnographic and archaeological data.

Voegelin (1938) mentions that in August several family groups or often whole villages would move into the lower elevations of pinyon areas. Here the Tübatulabal would gather berries, fish, catch small game, and hunt birds and deer. Voegelin (1938) mentions a particular settlement type characterized as a large camp which included a corral-like enclosure that would house a number of families and their supplies.

It is postulated that the archaeological manifestations of the above are represented at pinyon base camps. Archaeological research indicates that in general terms pinyon base camps served as:

1. habitation areas for relatively large population aggregates from July-August through mid November; and
2. centers for a variety of subsistence activities occurring within pinyon woodlands.

As such, they are generally located near a permanent water source at the lower elevations of a particular drainage system or at the confluence of several drainages. Undoubtedly, in the early and middle parts of summer subsistence activities were relatively "broad spectrum" in nature with emphasis on a variety of resources including digger pine nuts, herbaceous seeds, berries, and game. As pinyon nuts began to ripen toward late summer, activities centering around pinyon procurement and processing began to predominate.

Productive pinyon crops are characterized as being extremely variable according to location as well as erratic from year to year (Steward 1938). In addition, the period of most efficient harvesting lasts only for several weeks (Steward 1938). Given that there is no particular advantage gained in harvesting pinyon by groups much larger than single family units, this would seem to place a premium on mobility and dispersion of population aggregates; characteristics the rather static and nuclear pinyon base camps would not seem to correspond to.

The above paradox is resolved by a prehistoric land use strategy involving the additional use of a number of temporary pinyon stations in productive pinyon hinterlands during the height of the pinyon harvest.

These sites are uniformly small, possessing artifacts, ecofacts, and features heavily weighted toward vegetal processing which focused on pinyon as the major resource. Given the relatively homogeneous pinyon forest cover of this region, these sites tend to be located on small flat spurs and ridge lines that provide adequate camping space, an open view, and easy access to the surrounding pinyon forest. Proximity to stable water sources does not appear to have been a factor in temporary pinyon station locations, probably because of their extremely short occupation-use during the pinyon harvest. Indeed, Voegelin (1938) provides some ethnographic support for the above when she mentions that in fall single families would move into the higher elevations in mountain areas, build small temporary shelters, and harvest pinyon.

While the emphasis on pinyon exploitation may have shifted to temporary pinyon stations during the height of the pinyon harvest, this is not to imply that pinyon base camps were abandoned at this time. They probably still functioned in the same fashion as previously indicated except with a stronger emphasis on pinyon procurement, and, additionally, they may have served as resource distribution centers.

This latter contention is suggested by the faunal data. Temporary pinyon stations, while often containing hunting paraphernalia and deep midden deposits, possess almost no faunal remains. This is in contrast to the relatively rich faunal inventories at pinyon base camps. From this it is postulated that hunting activity was occasionally occurring in the context of temporary pinyon stations, yet most kills were being transported back to pinyon base camps for distribution among larger population aggregates. Other resources may have been distributed in the same fashion, but this contention awaits further research.

Hunting activity, suggested above to occasionally occur at temporary pinyon stations, was undoubtedly a major procurement activity throughout the entire seasonal occupation of upland pinyon areas as well as at various other times of the year.

Hunting expeditions consisting of one to three male members would venture out from larger settlements such as pinyon base camps and establish temporary hunting camps on the higher ridges and saddles in search of deer as well as mountain sheep. Most kills were transported back to base camps for further distribution.

From the foregoing discussion it is postulated that the prehistoric subsistence-settlement system of upland pinyon areas of the southern Sierra Nevada involved a tripartite division of functional site types, including: pinyon base camps, temporary pinyon stations, and temporary hunting camps. These subsistence-settlement site types and the relationships between them correspond closely to the ethnographic settlement subsistence pattern described by Voegelin (1938) for the Tübatulabal.

Further, this Tübatulabal pattern of upland pinyon procurement is of longstanding. Dated components of pinyon base camps, temporary pinyon stations, and temporary hunting camps indicate that the inception of this settlement-subsistence pattern began during the first millenium B.C. (Canebrake Phase) (see Chronometrics sections).

DESCRIPTIONS OF SITES LOCATED ALONG THE BEAR MOUNTAIN SEGMENT OF THE PACIFIC CREST TRAIL

KR-42

KR-42, as with KR-39 and KR-41, is located on the west side of a drainage directly adjacent to a permanent stream which flows in a southeastern direction toward Lamont Meadow. KR-42 is approximately 250-300 m southeast of KR-39 and KR-41. The site is situated at an elevation of 1981 m (6400 ft) on a broad drainage face which gently slopes toward the stream. The stream was flowing strongly in the middle of October, in 1978, and presumably would have been a relatively stable water source.

The vegetation cover at KR-41 includes a dense stand of pinyon pine and occasional digger pine. Other vegetation includes sage and rabbit brush, as well as assorted riparian plants along the stream.

THE SITE

KR-42 is a broad flaked stone concentration, essentially circular in shape (Map 6), encompassing an area of approximately 6000 m^2. Occasional obsidian flakes were encountered outside of this site perimeter for several hundred meters in either direction along the stream course. Government contract specifications authorized investigation of only the designated site area as displayed on Map 6. The cultural inventory of KR-42 includes a bedrock milling complex on the site's eastern perimeter near the stream, as well as numerous portable milling artifacts. No subsurface midden deposits were encountered at KR-42.

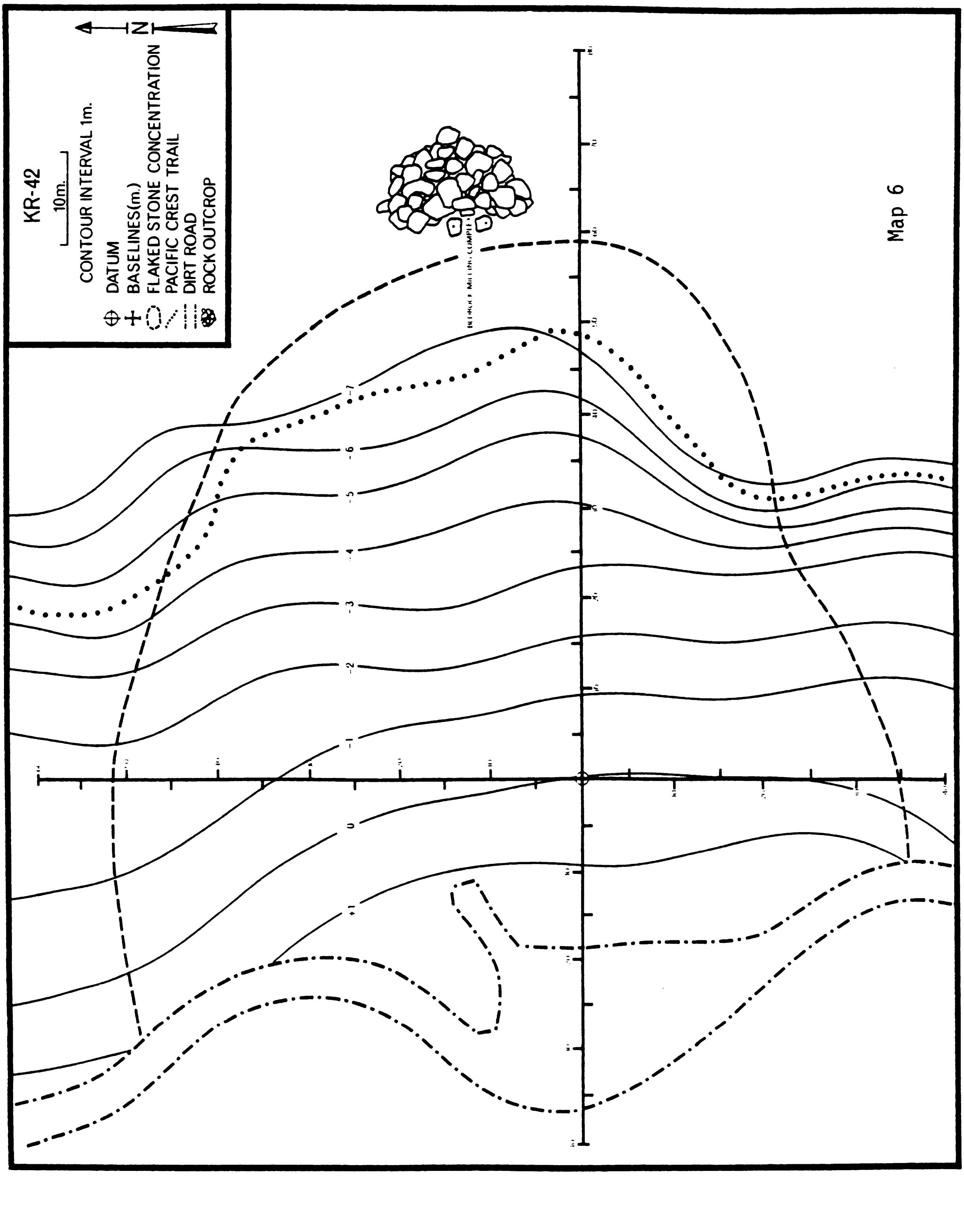
A dirt road cuts through the western edge of the site. Flaked stone material was found in this road cut, indicating that this portion of the site has been seriously disrupted. The Pacific Crest Trail loops to the east of the site along the stream bank, and does not appear to have seriously disturbed KR-42. No other observable impacts were recorded.

SURFACE FEATURES

Two bedrock mortars were located on a granite outcrop that lies at the eastern edge of the site next to the stream. Both mortars are ovoid in shape, each possessing a maximum length of 13 cm and a maximum width of 12 cm. Both mortars are 3 cm deep. In addition, a granite pestle 20 cm long, 17 cm wide, and 8 cm thick was found *in situ* directly atop this bedrock milling complex (Plate 2).

SURFACE COLLECTION

Due to the relatively large surface area and flaked stone density at KR-42 the collection of a 25% surface sample was undertaken. A north-south base line, bisecting the site, was extended from a centrally located datum point. Five randomly selected transects oriented in an east-west direction were collected. Each 5 m wide transect was divided into a series of 5 m sections; each section was then collected as a separate analytical unit. A total of 1900 m^2 of site surface area was collected in this fashion.


KR-42
10m.
CONTOUR INTERVAL 1m.
DATUM
BASELINES(m.)
FLAKED STONE CONCENTRATION
PACIFIC CREST TRAIL
DIRT ROAD
ROCK OUTCROP
N
-7
-6
-5
-4
-3
-2
-1
0
+1

Map 6

Plate 2. Bedrock milling complex located at KR-42. A pestle (left-center in the photograph) was found _in situ_ on top of this feature.

In addition, the entire site was surveyed for the purpose of collecting any time-sensitive artifacts and portable milling equipment, both of which are particularly susceptible to unauthorized collecting. A single projectile point located in the northeast quadrant was collected in this fashion.

Flaked Stone

A total of 3935 flaked stone items were recovered from the 25% random surface sample of KR-42 (Table 11). This represents an average flaked stone density of 246/100 m^2 of site surface area. Much of this assemblage consisted of unmodified waste flakes of primarily obsidian, although a number of bifacial tools and utilized flakes were also recovered. In addition, small amounts of quartzite, chalcedony, and basalt flaked stone material were also recovered.

Much of the flaked stone material occurs in discrete concentrations within the site. These areas are graphically represented in the computer-assisted flaked stone density map (Map 7).[1]

Projectile Points

A total of four classifiable projectile points was recovered from the surface of KR-42. Three of these projectile points, obtained from transects N5-10 m and N25-30 m, were classified as Cottonwood Triangular. The other, a Rose Spring Contracting Stem, was recovered from transect N 5-10 m. Four unclassifiable projectile point fragments were also recovered from the collection transects. Finally, a Desert Side-Notched projectile point was recovered outside of the surface transects in the northeast quarant.

Ground Stone

A strong emphasis on vegetal processing at KR-42 is indicated by the recovery of nine granite metate fragments as well as a single mano. These metates include both unifacial and bifacial specimens (see Ground Stone section).

Beads

A total of seven stone beads was recovered from KR-42. Four of these were of a talc schist material while the remaining three were manufactured from steatite (see Appendix 1).

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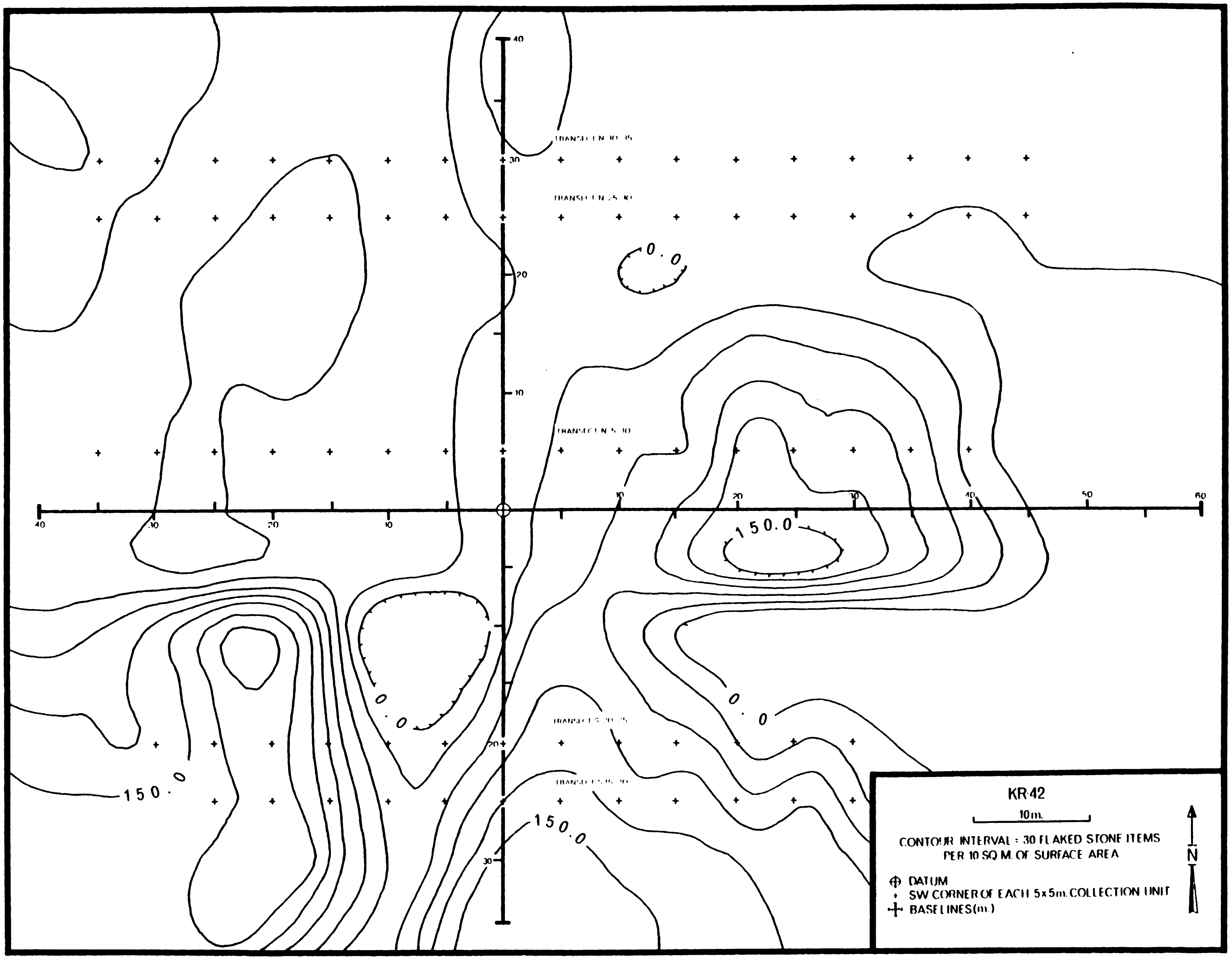
[1] A special computer program, a modified General Purpose Contour routine, was used to translate artifact frequency into a topographic contour analog map. Geographic coordinates were translated into topographic contours and the result was displayed through a CALCOMP plotting system (see also KR-48, -49, -57, and -64).



Map 7. Surface flaked stone density at KR-42

Miscellaneous Artifacts

A single stone pendant was recovered from the S 20-25 m transect. The pendant is approximately 2.5 cm long and 1.5 cm wide and was manufactured from a slate material. A bi-conical perforation, 4.0 mm in diameter, is located at one end of the pendant.

An artifact interpreted to be an arrow shaft straightener was recovered from transect N 25-30 m. It is made of a porous volcanic material, measures 5.5 x 3.0 cm, and possesses bifacial longitudinal grooves.

Faunal Remains

Five fragments of burnt bone were recovered from the surface of KR-42. Only one of these, an artiodactyl molar fragment, was identifiable.

TEMPORAL PLACEMENT

Initial occupation of KR-42 during the Sawtooth Phase (A.D. 600-1300) is suggested by the single Rose Spring Contracting Stem projectile point recovered at the site. The 3 Cottonwood Triangular, and one Desert Side-Notched, projectile points recovered indicate a subsequent Chimney Phase (A.D. 1300-1850) occupation.

In general, the seven stone beads with a suggested temporal range of A.D. 500-1810 (Garfinkel and Cook 1979), support the time span indicated by the projectile point sequence.

SUMMARY AND FUNCTIONAL IMPLICATIONS

KR-42 contains not only bedrock milling equipment but a number of examples of portable milling equipment, suggesting the exploitation of a wide range of plant resources (see Ground Stone section). This is not wholly unexpected considering the preponderance of pinyon and to a lesser extent, digger pine as well as the plant resources available from a riparian micro-environment.

A relatively large quantity of flaked stone debitage indicates that KR-42 served in some degree as an area of flaked stone tool manufacture. Further, the number of flakes exhibiting signs of utilization, as well as the recovery of projectile points and an arrowshaft straightener, clearly indicate the importance of hunting and butchering activities. Indeed, KR-42 was one of the few sites located along the Bear Mountain Segment that exhibited several surface fragments of burnt bone.

In addition, KR-42 may have very occasionally served as a general habitation area, as suggested by the recovery of a number of stone beads and a stone pendant. Undoubtedly, however, activity of this nature was sporadic, as inferred from the lack of midden development at the site. This may be readily explained by the close proximity of the deeply stratified pinyon base camps at KR-39 and KR-41 whose higher and more protected location may have simply been more desirable.

In conclusion, while KR-42 exhibits several attributes characteristic of divergent functional activities, the preponderance of vegetal processing equipment suggests it may primarily have served as a temporary pinyon station.

Table 11

KR-42. Surface Distribution of Artifacts and Ecofacts by Transect

	N 5-10 m	N 25-30 m	N 30-35 m	S 15-20 m	S 20-25 m	Total
Burnt Bone Fragments	-	-	-	1	4	5
Chalcedony						
Modified Flakes	1	-	1	1	-	3
Unmodified Flakes	4	2	3	11	13	33
Quartzite						
Unmodified Flakes	1	-	-	1	-	2
Basalt						
Unmodified Flakes	-	1	-	-	1	2
Obsidian						
Bifacial Tools	3	3	-	1	-	7
Unifacial Tools	1	-	-	-	-	1
Modified Flakes	68	26	12	44	35	185
Unmodified Flakes	743	338	394	995	1191	3661
Core Fragments	20	4	-	7	2	33
Projectile Points						
Cottonwood Triangular	2	1	-	-	-	3
Rose Spring	1	-	-	-	-	1
Unclassifiable Fragments	1	-	1	1	1	4
Ground Stone						
Metate Fragments	-	5	-	2	2	9
Mano	-	-	-	-	1	1
Beads	-	1	-	2	4	7
Arrowshaft Straightener	-	1	-	-	-	1
Stone Pendant	-	-	-	-	1	1

KR-39 and 41

KR-39 and 41 are located adjacent to a small permanently flowing creek which drains into Lamont Meadow three to four kilometers downstream. Precipitous granite scarps 5-10 m high constrict the creek drainage as the creek flows past these sites. KR-39 and -41 are situated on a relatively flat ridge at an elevation of 2000 m (6560 ft), atop the granitic scarps on the eastern side of the drainage. Perched as they are, KR-39 and 41 provide a commanding view of not only the creek directly below but of the entire drainage system down to, and including, Lamont Meadow (Plate 1). Vegetation both on the sites and the surrounding area is predominantly pinyon interspersed with juniper and sagebrush as well as assorted grasses. Willow and a number of other riparian plants are found along the creek bottom directly east of the sites.

Although these sites were initially considered to be separate and discrete archaeological entities, field reconnaissance suggests that KR-39 and 41 represent two loci of prehistoric activity within a single site. KR-41 is located directly atop the cliff face next to the creek, while KR-39 is situated approximately 150 m northwest of KR-41 on a relatively flat ridge area. While most artifactual material is concentrated within designated site areas, a significant quantity of flaked stone was observed along the ridge line between the two sites thus suggesting a singular archaeological entity. For purposes of description they shall be presented separately.

KR-41

THE SITE

KR-41 is located on a relatively small, flat area atop a large granitic scarp (Plate 4) that directly fronts the east side of a small, permanent stream. An extremely dense flaked stone concentration (almost exclusively of obsidian), as well as a dark midden deposit, are located within this flat area (Plate 3 and Map 8). The midden area measures approximately 22 x 18 m. While most of the flaked stone is concentrated in the flat area, a diffuse scatter extends for hundreds of meters in a northwest direction toward KR-39, as well as in a southern direction along the stream drainage.

The midden area and flaked stone concentration is surrounded in a "U-shaped" configuration by granite outcrops. Four bedrock milling complexes were observed in these granite outcrops. In addition, two other bedrock milling complexes were observed 50 and 100 m south of the midden area.

Due to the diffuse nature of the flaked stone scatter, the original Bureau of Land Management survey (Montizambert 1978) arbitrarily designated KR-41 as that area in the immediate vicinity of the midden area and bedrock milling complexes. This delineation shall be adhered to in this site description.

KR-41 has been severely disturbed by road building, cabin construction, and modern camping activity. Directly west of the site a bulldozer has carved out a circular turn-out. A poured cement slab is located on the west edge of the midden area. A small brush and tin structure, as well as a modern hearth, were found in the southern portion of the midden area. Finally, a modern refuse heap is located adjacent to the turn-out on the western perimeter of the site boundary. Evidently modern campers and hunters have made use of KR-41 for many years. One family who visited the site during excavation said they had collected numerous beads and arrowheads from the surface of KR-41.

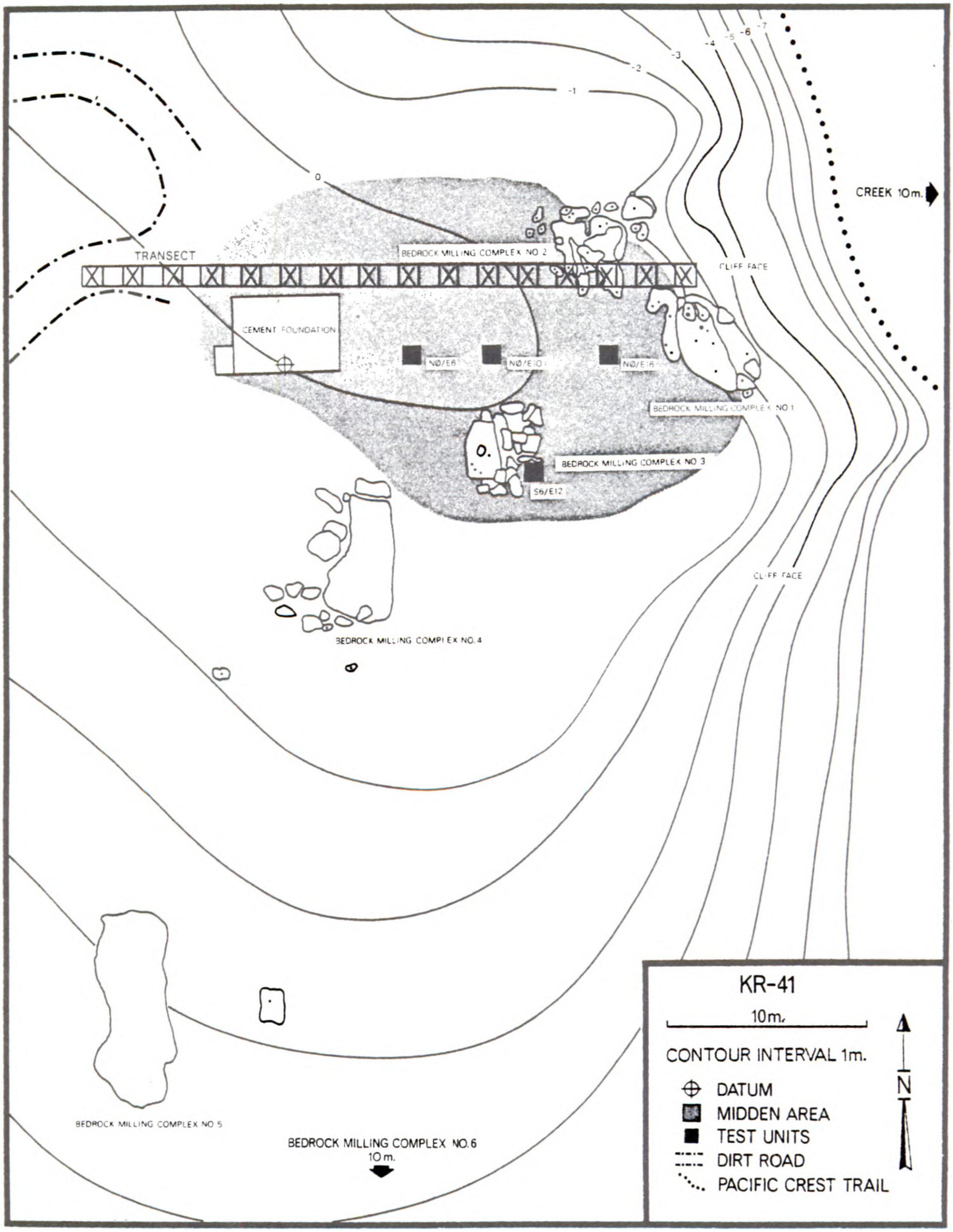
The Pacific Crest Trail runs along the stream below the granite scarp and KR-41.

SURFACE FEATURES

Six bedrock milling complexes were the only prehistoric surface features observed at KR-41. A total of 2 mortars and 49 metates was recorded on these granite outcrops. The mortars are located on Bedrock Milling Complex One; each is circular with diameters of 18 cm and 10 cm, and respective depths of 10 and 1 cm. Bedrock metates were frequently no more than smoothed ovoid surfaces upon the granite substrate, with no apparent depth. Only readily identifiable bedrock metates were recorded. Below is a list of metate frequencies and average dimensions for each bedrock milling complex:

Plate 3. The midden area at KR-41 (looking toward the southeast)

Plate 4. KR-41 is situated just out of view on a small, flat area on top of this granitic scarp.



CREEK 10m.
TRANSECT
BEDROCK MILLING COMPLEX NO. 2
CLIFF FACE
CEMENT FOUNDATION
NØ/E6
NØ/E10
NØ/E16
BEDROCK MILLING COMPLEX NO. 1
BEDROCK MILLING COMPLEX NO. 3
S6/E12
CLIFF FACE
BEDROCK MILLING COMPLEX NO. 4
BEDROCK MILLING COMPLEX NO. 5
BEDROCK MILLING COMPLEX NO. 6
10 m.
KR-41
10m.
CONTOUR INTERVAL 1m.
DATUM
MIDDEN AREA
TEST UNITS
DIRT ROAD
PACIFIC CREST TRAIL
N

Map 8

Bedrock Milling Complex	Number of Metates	Average Dimensions
1	14	40x28 cm
2	20	38x29 cm
3	4	31x25 cm
4	3	30x22 cm
5	2	29x17 cm
6	8	36x21 cm

SURFACE COLLECTION

The Bureau of Land Management did not initially require a systematic surface collection of KR-41 due to the extreme disturbances apparent at the site. Subsequent field reconnaissance of KR-41 indicated that gross estimates of flaked stone surface density and tool type variability could prove useful in spite of this disturbance.

Time and budgetary constraints allowed only for the collection of a single transect, 30 m long and 1 meter wide, spanning the width of the flaked stone concentration along an east-west axis (Map 8). Because of the extreme density of flaked stone material only alternating meter squares were collected from the surface transect. A total of 16 m^2 was collected in this fashion.

In addition, all time-sensitive artifacts including beads and projectile points were collected from the surface according to quadrant provenience. Distribution and frequencies of surface artifacts are indicated in Tables 13 and 14.

Flaked Stone

The most striking feature of KR-41 is the high surface density of obsidian flaked stone material. Single 1 m^2 collection units within the transect yielded upwards of several hundred flakes. The entire transect yielded 2172 flaked stone specimens, including bifacial tools, core fragments, and modified and unmodified flakes. All but 20 of these specimens were of obsidian. This corresponds to an estimated surface density (of flaked stone material) of 13,575/100 m^2.

Projectile Points

Three unclassifiable fragments of projectile points were collected from the surface transect of KR-41. In addition, a Cottonwood Triangular and a Rose Spring Contracting Stem projectile point type were found in the southeast and northeast quadrants, respectively.

Beads

Five white spheroid glass beads were found clustered together within a single 1 m^2 collection grid along the surface transect. Two steatite disk beads were also recovered from the surface transect. In addition,

a single translucent cobalt blue glass bead was recovered from the northeast quadrant.

Pottery

Four sherds of Owens Valley Brownware (Variant 1) were recovered from the surface transect at KR-41 (see Appendix 2).

EXCAVATION

While the surface of KR-41 has been seriously disrupted by modern camping activity, portions of the midden area appeared to have remained relatively unscathed. Four 1 m^2 test units were excavated within these comparatively undisturbed areas. These test units were selected to provide maximum areal coverage of the midden. Approximately one percent of the total midden area was excavated. All units were excavated in arbitrary 10 cm levels; all deposit was screened through one-eighth inch mesh. Table 14 indicates the distribution of subsurface artifacts and ecofacts at KR-41.

Stratigraphy

The four test units at KR-41 are located within a midden area interspersed with granite boulders and outcrops. Not surprisingly, midden depth was highly variable depending on the surface proximity of the underlying granite substrate. Test unit N0/16E, the unit closest to the granitic scarp, exhibited only 20-30 cm of homogenous gray-brown deposit (Munsell color 10 YR 3/2) before abruptly terminating at a bedrock surface.

Test unit S6/E12 also exhibited 20-30 cm of a homogenous gray-brown deposit (Munsell color 10YR 4/2) before being 80% closed off by granitic rock rubble. A small crevice of cultural deposit lay within this rock rubble and was excavated to a depth of 70 cm. At the 30 cm level the deposit began to slowly grade into a more granual texture and yellowish color; sterile decomposing granite was encountered at a depth of 70 cm.

Test unit N0/E6 exhibited 30-40 cm of homogenous gray-brown deposit (Munsell color 10YR 4/2), then slowly graded into decomposing granite terminating at 70 cm (Munsell color 10YR 5/2 at 60-70 cm).

Test unit N0/E10 contained 15-20 cm of homogenous gray-brown deposit (Munsell color 10YR 4/2); rock rubble and decomposing granite appeared abruptly at the 15-20 cm level. Several small pockets of cultural deposit were excavated between 20 cm and 40 cm.

Flaked Stone

The excavation at KR-41 resulted in the recovery of 24,750 flaked stone specimens, most of which were unmodified waste flakes, primarily of obsidian. Included in this assemblage were projectile points, point fragments, bifacial tools, and numerous modified flakes. In addition, small numbers of basalt, chalcedony, and quartzite flaked stone specimens were also encountered.

Similar to KR-39, KR-41 yielded vast quantities of unmodified flakes of obsidian. This would indicate that flaked stone tool manufacture, including secondary reduction, resharpening, and finishing was a major prehistoric activity occurring at KR-41 (see Flaked Stone Analysis).

Projectile Points

Eleven classifiable projectile points were recovered from subsurface deposits at KR-41. All of these projectile points were recovered from test units N0/E10 and N0/E6. This sample includes four Cottonwood Triangular, four Desert Side-Notched, and three Rose Spring Contracting Stem points. In addition, 13 unclassifiable projectile point fragments were recovered.

Ground Stone

One complete mano was recovered from test unit N0/E6. In addition, two metate fragments as well as one mano fragment were recovered from subsurface deposits at KR-41.

Beads

Test units at KR-41 yielded beads, all of which were manufactured from stone. These included three talc-schist disks, two steatite disks, and one serpentine disk (see Appendix 1).

Other Artifacts

Ten nodules of red ocher (hematite) as well as five quartz crystal fragments were recovered from subsurface deposits. Their inferred ceremonial use is discussed in the site description for KR-39.

Seven historic glass fragments and a single porcelain fragment were also recovered from KR-41. These all occurred in the 0-10 cm level, and undoubtedly were the result of modern camping activity.

Faunal Remains

A total of 31 identifiable bones and bone fragments was recovered from subsurface deposits at KR-41. Sixteen of these elements were identified as artiodactyl. The remaining 15 elements were identified as:

Odocoileus hemionus	_Neotoma lepida_	_Lepus californicus_
Citellus sp.	_Sciurus griseus_	
Thomomys sp.	_Syvilagus_ sp.	

In addition, 203 unidentifiable bones and bone fragments were recovered from KR-41 (see Faunal Analysis section).

Charred Plant Remains

The following identifiable charred seed parts and cone remains were obtained from test units NO/E6 and S6/E12 (no plant material was found in test units NO/W16 and NO/E10):

NO/E6	10-20 cm	1 pinyon and 1 digger cone scale
	20-30 cm	5 cone scales and 4 seed shells of digger pine, 1 _Chenopodium_ sp. seed
	30-40 cm	3 cone scales and 3 seed shells of digger pine, 1 pinyon cone scale, 1 _Sambucus_ sp. seed
	40-50 cm	1 seed shell of digger pine
	50-60 cm	1 seed shell of digger pine
	60-70 cm	1 cone scale of pinyon pine
S6/E12	10-20 cm	2 cone scales and 1 seed shell of pinyon pine
	20-30 cm	4 seed shell fragments of digger pine
	40-50 cm	4 seed shells of digger pine
	50-60 cm	1 seed shell of digger

TEMPORAL PLACEMENT

The following source-specific obsidian hydration dates were obtained from the subsurface deposits at KR-41:

Provenience	Cat. Number	Hydration Rim (Micron)	Date
NO/E6 0-10 cm	41-097*	2.42	A.D. 990
NO/E6 0-10 cm	41-102*	1.41	A.D. 1370
NO/E6 0-10 cm	41-103*	4.74	A.D. 153
NO/E6 0-10 cm	41-007	3.03	A.D. 766
NO/E6 10-20 cm	41-110	2.72	A.D. 879
NO/E6 20-30 cm	41-187	3.73	A.D. 513
NO/E6 30-40 cm	41-233	3.53	A.D. 585
NO/E6 40-50 cm	41-299	1.01	A.D. 1525
NO/E6 40-50 cm	41-344*	2.22	A.D. 1064
NO/E6 40-50 cm	41-337*	3.93	A.D. 422
NO/E6 50-60 cm	41-340	4.04	A.D. 302
NO/E6 60-70 cm	41-361	1.91	A.D. 1180
NO/E16 0-10 cm	41-382	1.91	A.D. 1180
NO/E16 10-20 cm	41-497	3.03	A.D. 766
NO/E16 20-30 cm	41-533	4.04	A.D. 404
NO/E10 0-10 cm	41-549*	1.61	A.D. 1293
NO/E10 0-10 cm	41-550*	1.65	A.D. 1278
NO/E10 0-10 cm	41-551*	1.01	A.D. 1525
NO/E10 0-10 cm	41-547	4.74	A.D. 153
NO/E10 10-20 cm	41-630	1.1	A.D. 1486
NO/E10 10-20 cm	41-681*	2.02	A.D. 1138
NO/E10 10-20 cm	41-680*	1.21	A.D. 1447
NO/E10 10-20 cm	41-682*	1.71	A.D. 1255
NO/E10 10-20 cm	41-683*	2.42	A.D. 990

Provenience	Cat. Number	Hydration Rim (Micron)	Date
N0/E10 20-30 cm	41-689	2.32	A.D. 1027
N0/E10 30-40 cm	41-726	1.41	A.D. 1370
S6/E12 0-10 cm	41-738	2.72	A.D. 879
S6/E12 10-20 cm	41-805	4.54	A.D. 224
S6/E12 20-30 cm	41-859	3.33	A.D. 657
S6/E12 30-40 cm	41-873	2.32	A.D. 1027
S6/E12 40-50 cm	41-883	2.82	A.D. 839
S6/E12 50-60 cm	41-889	2.32	A.D. 1027
S6/E12 60-70 cm	41-894	3.03	A.D. 766

*Projectile points

Basal dates of A.D. 153 and A.D. 302 indicate that KR-41 was first occupied during the latter end of the Canebrake Phase (1200 B.C. - A.D. 600). These basal dates are somewhat later than those obtained from the adjoining KR-39. Source-specific obsidian hydration dates also suggest a steady occupation of KR-41 through both the Sawtooth Phase (A.D. 600 - A.D. 1300) and Chimney Phase (A.D. 1300 - A.D. 1850).

Temporal placement of projectile points from KR-41 indicate that the most intensive use of KR-41 was during the Sawtooth and Chimney Phases. This is based on the recovery of four Rose Spring Contracting Stem projectile points which have a time range of A.D. 600 to A.D. 1300 as well as five Desert Side-Notched and five Cottonwood Triangular projectile points which have a range of A.D. 1300 to A.D. 1850.

The temporal placement of beads at KR-41 is generally consistent with a postulated Sawtooth and Chimney Phase occupation. The recovery of eight stone beads indicate an occupation prior to A.D. 1810 and perhaps as early as A.D. 500 (Garfinkel and Cook 1979). In addition, the identification of six glass trade beads demonstrate a protohistoric/historic habitation of KR-41.

Owens Valley Brownware is thought to have been a relatively recent introduction into eastern areas of the southern Sierra Nevada (Riddell and Riddell 1956). The recovery of four fragments of this pottery type adds further support to a Chimney Phase/historic occupation of KR-41.

Table 12

KR-41. Surface Distribution of Time-Sensitive Artifacts

	NW Quad	NE Quad	SW Quad	SE Quad	Total
Projectile Points					
Cottonwood Triangular	-	-	-	1	1
Rose Spring Series	-	1	-	-	1
Beads	-	1	-	-	1

Table 13

KR-41. Frequencies of Artifacts from Surface Transect

Chalcedony	
Unmodified Flakes	10
Quartzite	
Unmodified Flakes	10
Obsidian	
Bifacial Tools	3
Modified Flakes	84
Unmodified Flakes	2062
Core Fragments	3
Projectile Points	
Unclassifiable Fragments	3
Beads	7
Pottery Fragments	4
Ocher Nodules	1

Table 14

KR-41. Distribution of Subsurface Artifacts and Ecofacts

Unit N0/E6

	0-10	10-20	20-30	30-40	40-50	50-60	60-70	Total
Bone Fragments	24	7	2	16	3	3	11	66
Chalcedony								
Unmodified Flakes	11	3	3	2	3	-	-	22
Core Fragment	-	-	-	-	-	-	1	1
Basalt								
Unmodified Flakes	-	-	2	-	-	-	-	2
Quartzite								
Unmodified Flakes	-	1	-	1	-	-	-	2
Obsidian								
Bifacial Tools	5	4	2	4	2	1	-	18
Modified Flakes	51	30	21	31	10	7	6	156
Unmodified Flakes	2542	1203	1396	1334	575	526	306	7882
Core Fragments	7	-	5	-	-	4	-	16
Projectile Points								
Cottonwood Triangular	1	-	-	-	1	-	-	2
Desert Side-Notched	2	-	-	-	-	-	-	2
Rose Spring Series	-	-	-	-	1	-	-	1
Unclassifiable Fragments	-	-	1	1	-	-	-	2
Ground Stone and Processing Tools								
Mano	-	-	1	-	-	-	-	1
Metate Fragments	-	-	-	-	-	-	1	1
Beads	2	1	2	-	-	-	-	5
Ocher Nodules	2	-	-	-	-	-	-	2
Quartz Crystals	1	-	-	-	-	-	-	1

Table 15

KR-41. Distribution of Subsurface Artifacts and Ecofacts

Unit S6/E12

	0-10	10-20	20-30	30-40	40-50	50-60	60-70	Total
Bone Fragments	25	25	7	3	1	1	1	63
Chalcedony								
Unmodified Flakes	10	7	1	-	-	1	-	19
Basalt								
Unmodified Flakes	-	-	-	-	-	1	-	1
Quartzite								
Unmodified Flakes	1	5	1	-	2	2	-	11
Obsidian								
Bifacial Tools	-	2	-	-	-	-	-	2
Modified Flakes	24	22	7	2	1	2	2	59
Unmodified Flakes	1742	1200	500	191	67	141	51	3892
Core Flakes	15	-	-	-	-	-	-	15
Projectile Points								
Unclassifiable Fragments	-	2	1	-	-	-	-	3
Ground Stone and Processing Tools								
Metate Fragments	-	1	-	-	-	-	-	1
Ocher Nodules	3	1	-	-	1	-	-	5
Quartz Crystals	3	-	-	-	-	-	-	3
Historic Glass Fragments	7	-	-	-	-	-	-	7

Table 16

KR-41. Distribution of Subsurface Artifacts and Ecofacts

Unit N0/E10

	0-10	10-20	20-30	30-40	Total
Bone Fragments	16	13	8	1	38
Chalcedony					
Unmodified Flakes	9	7	2	1	19
Basalt					
Unmodified Flakes	1	1	-	-	2
Quartzite					
Unmodified Flakes	1	-	-	-	1
Obsidian					
Bifacial Tools	2	3	-	-	5
Modified Flakes	49	18	23	3	93
Unmodified Flakes	2771	1712	1211	269	5963
Core Fragments	18	13	-	-	31
Projectile Points					
Cottonwood Triangular	2	-	-	-	2
Desert Side-Notched	-	3	-	-	3
Rose Spring Series	1	1	-	-	2
Unclassifiable Fragments	1	2	1	-	4
Ground Stone and Processing Tools					
Mano Fragment	-	1	-	-	1
Beads	1	-	-	-	1
Porcelain Fragment	1	-	-	-	1

Table 17

KR-41. Distribution of Subsurface Artifacts and Ecofacts

Unit NO/E16

	0-10	10-20	20-30	Total
Bone Fragments	46	18	9	73
Chalcedony				
Bifacial Tools	1	-	-	1
Unmodified Flakes	20	6	1	27
Basalt				
Unmodified Flakes	1	-	-	1
Obsidian				
Bifacial Tools	2	1	1	4
Modified Flakes	41	15	6	62
Unmodified Flakes	4206	1808	404	6418
Core Fragments	23	-	-	23
Projectile Points				
Unclassifiable Fragments	4	-	-	4
Ocher Nodules	3	-	-	3
Quartz Crystals	1	-	-	1
Miscellaneous Smoothed Cobbles	-	2	-	2

KR-39

THE SITE

KR-39 is located in a relatively flat area of a small ridge 150 m northwest of KR-41 (Plate 5). A large midden deposit (approximately 2500 m^2) as well as the center of a flaked stone concentration are located on this flat area (Map 9). In addition, several specimens of portable milling equipment as well as a single locus of bedrock milling were observed at KR-39.

Unfortunately, most of the site area has been severely disrupted by dirt road construction and mining activity. Adjacent to the northwestern perimeter of the site is the Fox Mill historic mining site. Dirt roads that traverse the site are still extensively used by campers and hunters. Most of these disturbances appear to be confined to clearings, roads, and the mining site location. Portions of the site area not affected by road construction and mining activity appear to be relatively undisturbed.

The Pacific Crest Trail runs along the creek drainage approximately 80 m northeast of the site datum.

SURFACE FEATURES

A single bedrock grinding slick, ovoid in shape, is located on a small boulder 1 m northeast of the datum (Map 9). No other surface features were observed at KR-39.

SURFACE COLLECTION

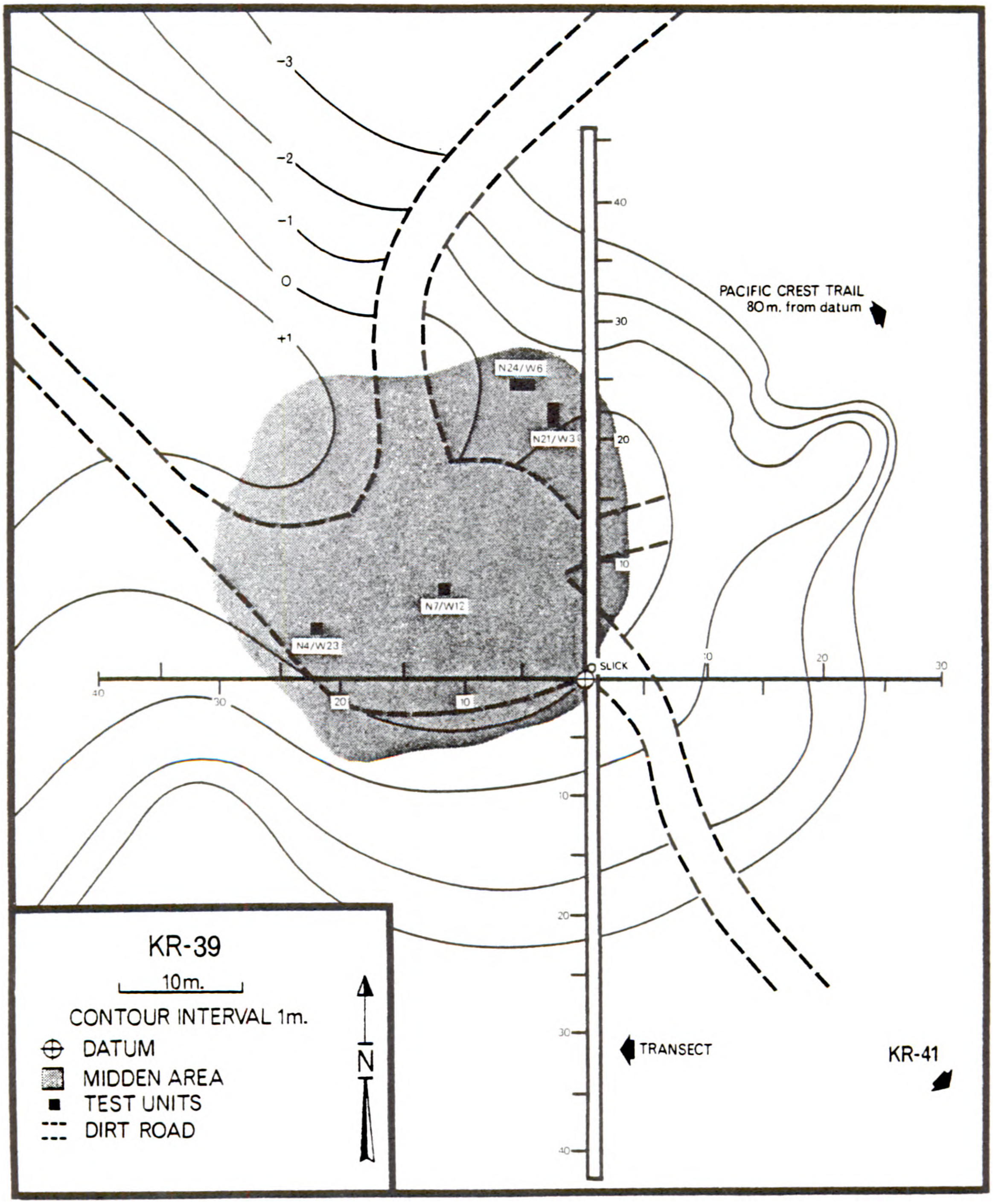
The Bureau of Land Management did not initially require a systematic surface collection of KR-39 because of the extreme disturbance apparent at the site. However, subsequent field reconnaissance of KR-39 indicated that gross estimates of flaked stone surface density and tool type variability could prove useful in spite of this disturbance.

Time and budgetary constraints allowed only for the collection of a single 1 m wide transect spanning the width (85 m) of the site along the north-south datum line. A 100% collection was made along this transect in 5 m increments.

In addition, all time-sensitive artifacts and portable milling equipment were collected from the surface according to quadrant provenience. As this class of artifacts is susceptible to unauthorized collection by relic hunters, the government stipulated such a collection procedure during field reconnaissance. Distribution and frequencies of surface artifacts are indicated in Tables 18 and 19.

Flaked Stone

A total of 825 flaked stone items was recovered from the single surface transect at KR-39. All but seven of these specimens were of



-3
-2
-1
0
+1
N24/W6
N21/W3
N7/W12
N4/W23
SLICK
PACIFIC CREST TRAIL
80m. from datum
TRANSECT
KR-41
KR-39
10m.
CONTOUR INTERVAL 1m.
DATUM
MIDDEN AREA
TEST UNITS
DIRT ROAD
N

Map 9

Plate 5. View of northern midden area of KR-39 near test units N24/W6 and N21/W3.

obsidian, the remainder were chalcedony. Average flaked stone density within the transect was 970 items/100 m^2. If the density within the transect is roughly indicative of density over the entire site, KR-39 contains one of the higher surface concentrations of flaked stone material among the sites located along the Bear Mountain Segment.

Projectile Points

A single Cottonwood Triangular projectile point was recovered from the surface transect.

Ground Stone

A strong emphasis on vegetal processing at KR-39 is indicated by the recovery of nine metate fragments as well as a single mano from the northwest quadrant. The metates include both unifacial and bifacial specimens of granite and slate (see Ground Stone section).

Beads

Two faceted, cobalt blue trade beads, one of which was located in the northeast quadrant while the other was found in the surface transect, were recovered from KR-39. In addition, a steatite disk bead and a turquoise colored glass bead were recovered from the northwest and southwest quadrants, respectively.

EXCAVATION

Two 1 x 2 m square test units (N24/W6 and N21/W3), as well as two 1 x 1 m square test units (N4/W23 and N7/W12) were excavated at KR-39. These test excavations represent approximately a 0.5% sample of the total midden area. Contract specifications called for subsurface sampling in both disturbed and undisturbed areas of the midden deposit. Test units N24/W6 and N21/W3 were located in what appeared to be the only undisturbed midden at KR-39. Test units N4/W23 and N7/W12 were located in a disturbed midden that had been graded for vehicle use. This disturbance by road grading machinery appears to have merely scraped off the upper levels of the midden without seriously disrupting remaining deposits. All units were excavated in arbitrary ten centimeter levels; all deposit was screened through one-eighth inch mesh. Table 20 indicates the distribution of subsurface artifacts and ecofacts at KR-39.

Stratigraphy

Not surprisingly, the test units in the undisturbed midden (N24/W6 and N21/W3) exhibited a deeper deposit than those in the graded road area (N4/W23 and N7/W12). The first 20-25 cm of deposit in the undisturbed area consisted of a loosely compacted gray-brown midden (Munsell color

10YR 4/2). At 25-30 cm the deposit began to exhibit a slow grade into a more compacted consistency and yellowish color (Munsell color 10YR 5/2 at 40-50 cm). A concomitant decrease in the amount of charcoal and the number of artifacts was also evident. At the 60-80 cm level the deposit had completely yielded to a hard yellowish, decomposing granite.

Test units N4/W23 and N7/W12 in the disturbed midden area contained only 30-50 cm of excavatable deposit. However, the stratigraphic structure of these units is similar to those in the undisturbed midden. The first 20 cm of deposit consisted of a loose grayish-brown midden (Munsell color 10YR 4/2) from which most artifacts and charcoal were recovered. At approximately 20-30 cm the deposit began to quickly grade into a compacted texture and yellowish color (Munsell color 10YR 4/3 at 20-30 cm). At 30-45 cm the deposit had given way to solid decomposing granite.

Flaked Stone

The excavation at KR-39 resulted in the recovery of approximately 25,000 flaked stone items, most of which were unmodified waste flakes, predominately of obsidian. Included in this assemblage were projectile points, point fragments, unifacially and bifacially flaked tools and numerous modified flaked stone specimens. Small amounts of basalt, chalcedony, and quartzite flaked stone material were also recovered.

Of interest is the vast amount of flaked stone observed at KR-39. Single 10 cm excavation levels would contain up to 2000 unmodified flakes. This would indicate that flaked stone tool manufacture, including secondary reduction and retouch, was a major prehistoric activity occurring at KR-39 (see Flaked Stone Analysis).

Projectile Points

Twenty-one projectile points were recovered from the subsurface deposits at KR-39. Seventeen of these points were unclassifiable fragments. The remaining projectile points consisted of one Humboldt Concave Base A, two Rose Spring Contracting Stem, and one Cottonwood Triangular. Source-specific obsidian hydration dating was used on all subsurface projectile points to provide additional temporal data (see Chronometrics section for a discussion of typological and temporal placement of projectile points).

Ground Stone and Processing Tools

Essential to the preparation of pinyon nuts and acorns are grinding and crushing tools, including manos, hammerstones, pestles and metates. All of these artifacts were part of the subsurface tool assemblage at KR-39. Complete specimens included: one mano, two hammerstones, and one pestle. Ten metate fragments as well as one pestle fragment were also recovered (see Ground Stone section).

Core Tools

Twelve large cobbles of felsite and milky quartz were recovered from

subsurface deposits. These exhibited faint battering along employable edges and in some cases appeared to have been purposely shaped by percussion flaking. In several specimens the preceeding diagnostic criteria were difficult to discern. The use of the large core tools is unclear although some form of heavy vegetal processing involving shredding or pounding seems plausible (see Flaked Stone Analysis).

Beads

A total of 30 subsurface beads were recovered from KR-39. This assemblage included 5 stone beads, of which two are steatite, one serpentine, and one talc schist. The stone beads all were 6 mm or greater in diameter with perforations greater than 2 mm. Fifteen glass trade beads were also recovered from the deposit. Included in this glass bead sample were: eight translucent cobalt blue faceted, two translucent red, one translucent red with a white center, one white opaque, one black opaque, and two translucent red with black centers. In addition, ten Olivella saucer disk beads were recovered from subsurface deposits at KR-39 (see Appendix 1).

Pottery

A single shard of Owens Valley Brownware (Variant II) was recovered from the 10-20 cm level of Unit N7/W12 (see Appendix 2).

Other Artifacts

Several artifacts were recovered which can be inferred to have functioned in a religious or ceremonial context. These include 27 quartz crystal artifacts and four nodules of red ocher (hematite). Quartz crystals are thought to have been used as talismans by either lay individuals or shamans. Such use has been described ethnographically for a number of groups throughout California including the Tübatulabal (Levi 1978; Applegate 1978; Voegelin 1938). Ocher served as a base for pigment used in a ceremonial context either for paintings (pictographs) or body decoration.

As a final note, a local artifact collector who has visited the area for a number of years claims to have collected a number of projectile points from KR-39. She also mentioned that she had picked up from five to seven stone pendants with serrated edges.

Faunal Remains

A total of seven identifiable bone and bone fragments was recovered from subsurface deposits at KR-39. Two of these elements were identified as artiodactyl. The remaining five elements were identified as:

Odocoileus hemionus	*Syvilagus* sp
Ovis canadensis	*Sciurus griseus*

In addition, 88 unidentifiable bone and bone fragments were recovered from KR-39 (see Faunal Analysis section).

Charred Plant Remains

The following identifiable charred plant remains were obtained from test units N4/W23, N24/W6 and N4/W23. (No plant material was found in N7/W12.)

N21/W3	10-20 cm	10 pinyon cone scale parts
	20-30 cm	35 pinyon cone scales, cone axis, and seed coat parts, 1 digger cone scale.
	30-40 cm	12 pinyon cone scale parts; 1 Fremontodendron seed.
	40-50 cm	9 pinyon cone scales and seed coat fragments.
	50-60 cm	6 cone scale parts, 1 pinyon cone axis, 1 pinyon-seed; 2 digger seeds.
	60-70 cm	1 cone scale.
	70-80 cm	2 cone scales.
N24/W6	10-20 cm	1 pinyon cone scale.
	20-30 cm	1 pinyon cone scale, 1 Rosa seed.
	30-40 cm	10 pinyon and digger cone scales.
	40-50 cm	15 cone scale parts, 3 pinyon seed shells, 1 Rosa seed.
	50-60 cm	16 pinyon cone scales and 2 pinyon shells.
N4/W23	20-30 cm	3 pinyon cone scale parts; 1 Rosa seed.
	30-40 cm	1 cone scale.

Temporal Placement

The following source-specific obsidian hydration dates were obtained from the subsurface deposits at KR-39:

Provenience		Cat. Number	Hydration Rim (microns)	Date
N4/W23	0-10 cm	39-008*	1.81	A.D. 1217
N4/W23	0-10 cm	39-016	2.02	A.D. 1138
N4/W23	10-20 cm	39-027	5.15	A.D. 9
N4/W23	20-30 cm	39-036	5.25	25 B.C.
N4/W23	30-40 cm	39-077	3.83	A.D. 477
N24/W6	10-20 cm	39-151	3.03	A.D. 766
N24/W6	20-30 cm	39-203*	2.43	A.D. 1030
N24/W6	30-40 cm	39-260	2.22	A.D. 1064
N24/W6	40-50 cm	39-274	4.44	A.D. 259
N7/W12	0-10 cm	39-287	6.16	344 B.C.
N7/W12	10-20 cm	39-347*	4.64	A.D. 188
N7/W12	20-30 cm	39-375	5.05	A.D. 44
N7/W12	30-40 cm	39-399	2.63	A.D. 916
N7/W12	40-50 cm	39-420	4.80	A.D. 113
N21/W3	0-10 cm	39-448	3.13	A.D. 729
N21/W3	10-20 cm	39-527	3.03	A.D. 766
N21/W3	10-20 cm	39-528*	3.03	A.D. 766
N21/W3	20-30 cm	39-593	.85	A.D. 1588
N21/W3	30-40 cm	39-629	.14	A.D. 1833

Provenience		Cat. Number	Hydration Rim (microns)	Date
N21/W3	40-50 cm	39-675	3.03	A.D. 766
N21/W3	50-60 cm	39-702	3.63	A.D. 549
N21/W3	60-70 cm	39-740	3.43	A.D. 621
N21/W3	70-80 cm	39-752	6.06	309 B.C.

*Projectile points

Basal dates of 309 B.C., 344 B.C. and 26 B.C. suggest that KR-39 was one of the earlier occupied sites along the Bear Mountain Segment. In addition to the early use of KR-39 during the Canebrake Phase, source-specific obsidian hydration dates also indicate a steady occupation of KR-39 through the Sawtooth and Chimney Phases.

The source-specific obsidian hydration dates are further corroborated by the projectile point sequence. A single Humboldt Concave Base A point with a suggested temporal range of 1200 B.C.-A.D. 600 (see Chronometrics section), is further evidence of an early Canebrake occupation. Subsequent occupation during the Sawtooth and Chimney Phases is suggested by the recovery of two Rose Spring Contracting Stem and two Cottonwood Triangular projectile points.

In general, the glass trade beads recovered indicate a protohistoric occupation of KR-39 after 1816 (Gibson 1975). A single cobalt blue cylinder bead is representative of an early style that could have entered the area in the 1780's (Gibson 1975). Little chronometric information is available for the six stone beads, although their manufacture has been suggested to have occurred between A.D. 500 and A.D. 1810 (Garfinkel and Cook 1979). A single Olivella callus-cup bead found in test unit N7/W12 is characteristic of shell beads manufactured from A.D. 1000 - 1785 (King 1974). The remaining nine Olivella saucer-disk beads with perforations less than 2 mm in diameter indicate manufacture after 1785 (King 1975).

The recovery of a single shard of Owens Valley Brownware is indicative of a late Chimney Phase/historic occupation (Riddell and Riddell 1956).

Table 18

KR-39. Surface Distribution of Time-Sensitive Artifacts and Portable Milling Equipment

	NW Quad	NE Quad	SW Quad	SE Quad	Total
Projectile Point Fragments	3	-	-	-	3
Ground Stone Artifacts					
Metate Fragments	9	-	-	-	9
Mano	1	-	-	-	1
Beads	2	-	1	-	3

Table 19

KR-39. Frequencies of Artifacts from Surface Transect

Chalcedony	
Unmodified Flakes	6
Core Shatter	1
Obsidian	
Unifacial Tools	1
Bifacial Tools	9
Modified Flakes	16
Unmodified Flakes	781
Core Shatter	9
Projectile Points	
Cottonwood Triangular	1
Point Fragments	1
Beads	1

Table 20

KR-39. Distribution of Subsurface Artifacts and Ecofacts

Unit N21/W3

	0-10	10-20	20-30	30-40	40-50	50-60	60-70	70-80	Total
Bone Fragments	5	-	1	1	6	2	4	-	19
Chalcedony									
Modified Flakes	3	2	-	-	-	-	-	-	5
Unmodified Flakes	29	53	28	22	19	18	14	1	184
Basalt									
Unmodified Flakes	1	1	-	1	1	-	-	-	4
Quartzite									
Unmodified Flakes	-	2	1	-	-	-	1	-	4
Obsidian									
Bifacial Tools	4	7	3	3	1	3	-	1	22
Unifacial Tools	7	-	-	-	-	-	-	-	7
Modified Flakes	23	15	10	9	6	4	3	-	70
Unmodified Flakes	1591	1618	886	861	637	598	320	105	6616
Core Shatter	19	5	2	-	-	-	-	-	26
Projectile Points									
Rose Spring	-	1	-	-	-	-	-	-	1
Ground Stone and Processing Tools									
Metate Fragments	-	-	-	-	3	-	1	-	4
Felsite Core Tools	-	-	-	-	-	-	1	-	1
Beads	11	-	-	1	-	-	-	-	12
Steatite Fragment	-	-	-	-	-	-	1	-	1
Ocher Nodules	-	3	-	-	-	-	1	-	4
Quartz Crylstals	-	3	-	1	-	1	1	-	6

Table 21

KR-39. Distribution of Subsurface Artifacts and Ecofacts

Unit N4/W23

	0-10	10-20	20-30	30-40	Total
Bone Fragments	3	4	1	1	9
Chalcedony					
Unmodified Flakes	17	16	5	3	41
Basalt					
Unmodified Flakes	-	1	-	-	1
Obsidian					
Bifacial Tools	3	3	3	1	10
Unifacial Tools	2	2	1	1	6
Modified Flakes	6	8	6	2	22
Unmodified Flakes	859	1041	532	94	2526
Core Shatter	2	1	2	-	5
Projectile Points					
Cottonwood Triangular	1	-	-	-	1
Unclassifiable Fragments	1	2	-	-	3
Ground Stone					
Mano	-	-	-	1	1
Metate Fragments	-	1	1	-	2
Beads	2	5	2	-	9
Quartz Crystals	6	2	2	-	10

Table 22

KR-39. Distribution of Subsurface Artifacts and Ecofacts

Unit N7/W12

	0-10	10-20	20-30	30-40	40-50	Total
Bone Fragments	27	29	3	-	-	59
Chalcedony						
Bifacial Tools	1	-	-	-	1	2
Modified Flakes	1	-	-	-	-	1
Unmodified Flakes	31	33	31	34	3	132
Basalt						
Modified Flakes	1	-	-	-	-	1
Unmodified Flakes	-	2	-	-	-	2
Quartzite						
Unmodified Flakes	-	2	-	-	-	2
Obsidian						
Bifacial Tools	3	1	3	2	3	12
Unifacial Tools	3	2	-	-	-	5
Modified Flakes	18	8	6	6	3	41
Unmodified Flakes	1305	1273	1051	1778	145	5552
Core Shatter	3	2	4	12	2	23
Projectile Points						
Humboldt Concave Base	-	1	-	-	-	1
Unclassifiable Fragments	-	3	2	-	-	5
Ground Stone and Processing Tools						
Pestle	-	-	1	-	-	1
Metate Fragments	-	-	2	-	-	2
Felsite Core Tools	-	-	2	1	-	3
Beads	2	2	1	-	-	5
Quartz Crystals	-	-	1	1	-	2
Pottery	-	1	-	-	-	1

Table 23

KR-39. Distribution of Subsurface Artifacts and Ecofacts

Unit N24/W6

	0-10	10-20	20-30	30-40	40-50	50-60	Total
Bone Fragments	1	2	3	-	1	1	8
Chalcedony							
Modified Flakes	-	-	-	-	1	-	1
Unmodified Flakes	57	59	64	51	17	12	260
Basalt							
Unmodified Flakes	-	2	-	-	-	-	2
Quartzite							
Unmodified Flakes	-	4	1	-	-	-	5
Core Shatter	2	-	-	-	-	-	2
Obsidian							
Bifacial Tools	7	8	-	2	1	1	19
Unifacial Tools	2	2	1	1	-	-	6
Modified Flakes	13	11	8	7	3	3	45
Unmodified Flakes	2288	2174	1866	1173	509	524	8535
Core Shatter	1	-	-	-	-	-	1
Projectile Points							
Rose Spring	-	-	1	-	-	-	1
Unclassifiable Fragments	3	1	-	-	-	-	4
Ground Stone and Processing Tools							
Hammerstone	-	-	2	-	-	-	2
Pestle Fragment	-	-	1	-	-	-	1
Metate Fragment	-	-	-	-	3	-	3
Core Tools	-	-	3	3	1	1	8
Beads	2	2	-	-	-	-	4
Quartz Crystals	3	1	-	-	2	3	9

Summary and Functional Implications for KR-41 and -39

Ethnographic accounts (Voegelin 1938) indicate that in August large aggregates of Tübatulabal population would move into the lower elevations of pinyon areas and establish pinyon base camps. These pinyon base camps consisted of a circular brush enclosure 30-50 ft in diameter with a single entrance on the east side. The Tübatulabal would camp inside this enclosure in family groups. A number of subsistence activities other than pinyon procurement such as the gathering of juniper berries, fishing, and the hunting and trapping of deer and small game were also conducted during this time (Voegelin 1938). While ethnographic information is sparse, it does appear that a number of activity sets were manifest at pinyon base camps. In addition, it can also be inferred that a population aggregate certainly larger than a single family unit occupied these seasonal base camps.

Archaeological data from KR-39 and 41 correspond to this description of a Tübatulabal pinyon base camp, and also serve to further elucidate the heterogeneous nature of prehistoric activities occurring at these base camps. The archaeological correspondence to the ethnographic description of pinyon base camps is most generally noted in the large size and presence of substantial midden areas at KR-39 and 41. These factors suggest a more intense level of occupation by a greater number of people as would be expected at pinyon base camps.

Subsistence activities focused on vegetal processing and are indicated by the presence of a substantial quantity of bedrock and portable milling equipment. That pinyon was a predominate resource is corroborated by the recovery of numerous charred pinyon cone scales and seed coat parts from subsurface deposits. At the same time, plant resource exploitation involving digger pine nuts is indicated by the abundant subsurface remains of charred digger pine seed coats and cone scales. In addition, vegetal processing involving the shredding and pounding of some unspecified plant fiber is suggested by the recovery of 12 core tools.

Not surprisingly, the midden deposits contained a relatively high quantity of faunal material representing a broad species diversity (see Faunal Analysis). The corresponding lack of faunal material in midden deposits of temporary pinyon stations located along the Bear Mountain Segment suggests that much of the preparation, distribution, and consumption of game was occurring at pinyon base camps.

Analysis of the flaked stone assemblage at KR-39 and 41 (see Flaked Stone Analysis) revealed a relatively wide range of inferred functions (e.g. cutting, scraping, etc.). In addition, a vast amount of unmodified flaked stone was recovered from KR-39 and 41. This data suggest an intensification of flaked stone tool manufacturing procedures, especially secondary reduction, and finishing activities.

The presence of ceramics, steatite pendants, and a number of beads suggests that KR-39 and 41 was a major habitation area, consistent with the ethnographic description of a Tübatulabal pinyon base camp. This is further confirmed by the recovery of ceremonial objects such as quartz crystals and red ocher (hematite) nodules. Rock crystals found within archaeological sites are most likely items used by lay individuals or shamans as talismans or power objects. This use has been described ethnographically for a virety of groups throughout California (Levi 1978;

Applegate 1978). Quartz crystals are also included as items within a Tübatulabal weather shaman's bundle curated at the Kernville Museum. Ocher was used as a base for pigment and was traded widely in California (Heizer and Treganza 1944). Paint was used in conjunction with the production of rock paintings (pictographs) and in ceremonial body decoration.

In conclusion, site size and surface features, as well as the artifactual and ecofactual constituents of KR-39 and 41, indicate a wide vareity of habitation and subsistence activities. This elaboration of subsistence and habitation activities corresponds to the ethnographic descriptions of a Tübatulabal pinyon base camp. Dating through the analysis of the stylistic attributes of projectile points, and beads, as well as source specific obsidian hydration dates indicate that occupation of KR-39 and 41 commenced during the Canebrake Phase (1200 B.C. - A.D. 600), and continued through both the Sawtooth (A.D. 600 - 1300) and Chimney (A.D. 1300 - 1850) phases up to the historic period.

KR-48

KR-48 is situated along a broad, relatively level aspect of the same ridge as that occupied by KR-64; which lies approximately 300 m to the northwest. Located at an elevation of 2097 m (6920 ft), the site's vegetation is predominately pinyon pine with an understory of flannelbush, sage and box thorn. Two intermittent drainages flank KR-48; one runs along the northeastern limit of the site, the other along its southwestern border. The nearest permanent water source is a small intermittent stream located 400 m southeast of the site. This is the same drainage along which KR-39, 41 and 42 are located.

THE SITE

KR-48 consists of a large, albeit diffuse flaked stone scatter covering some 3600 m^2 (Map 10). There is no evidence of either midden or groundstone artifacts. Surface disturbances include a jeep trail which bisects the site and the existing Pacific Crest Trail which skirts the site's northeast perimeter (Plate 6).

SURFACE COLLECTION

Once the site's approximate boundaries were delineated, a datum was established on a large rock along the southwest edge of the jeep trail. A north-south baseline was then laid out, extending 40 m in both directions. Six randomly selected east-west transects, each composed of 1 x 5 m collection units and running the length of the site, were then staked out. These transects, representing 375 m^2 or 10% of the site's surface area, were 100% collected. Following the collection of the transects, the site was divided into quadrants using the datum as a reference point. All time sensitive artifacts were then collected from these quadrants.

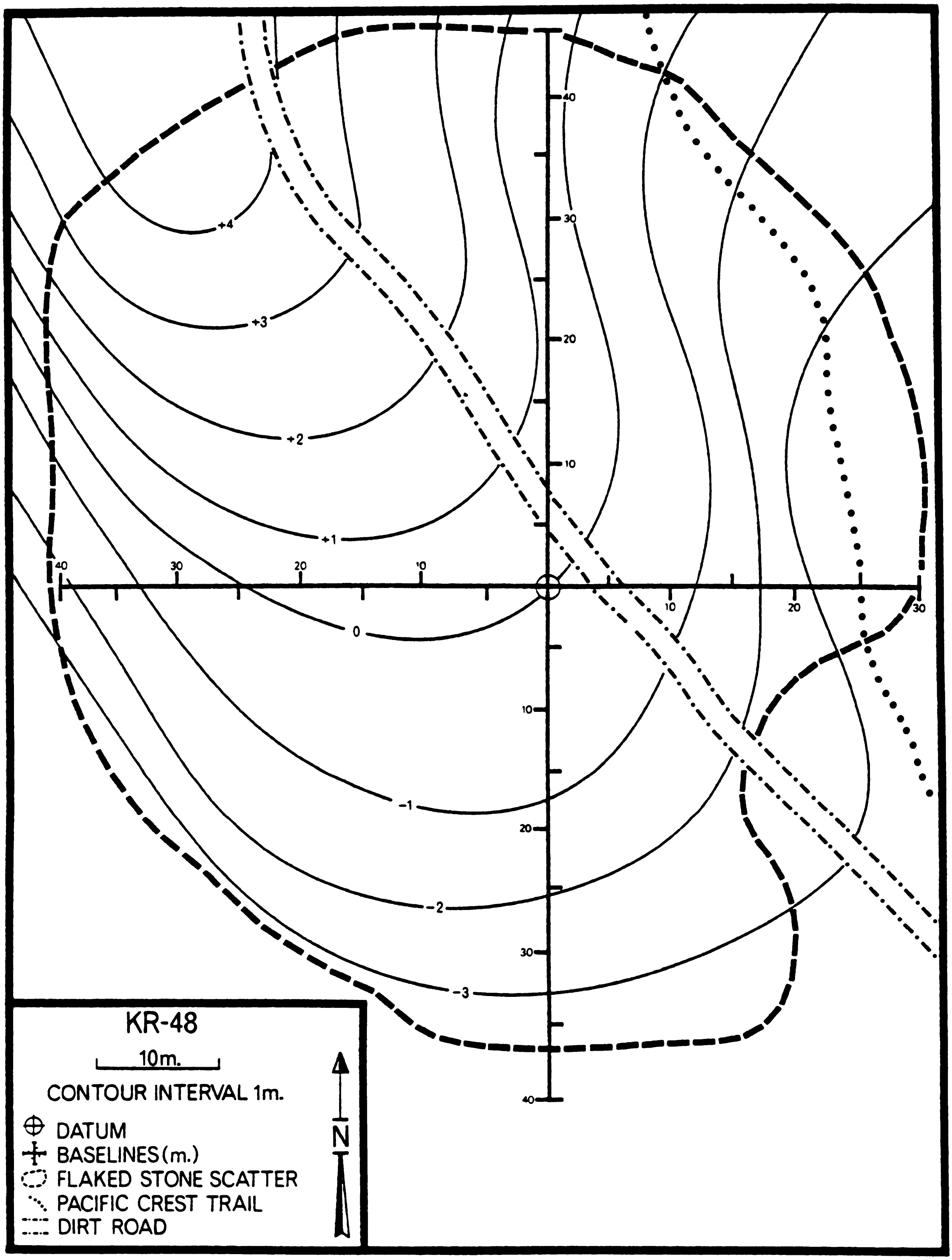
Flaked Stone

The data obtained from the surface collection are summarized in Table 24. It is evident that obsidian is the dominant flaked stone material, accounting for 99% of all artifacts collected. Unmodified flakes make up the bulk of the sample (83%) followed by modified flakes (15%) and bifacial tools and projectile point fragments (2%). Discrete concentrations of flaked stone material within KR-48 are graphically represented in the computer assisted flaked stone density map on the following page (Map 11).

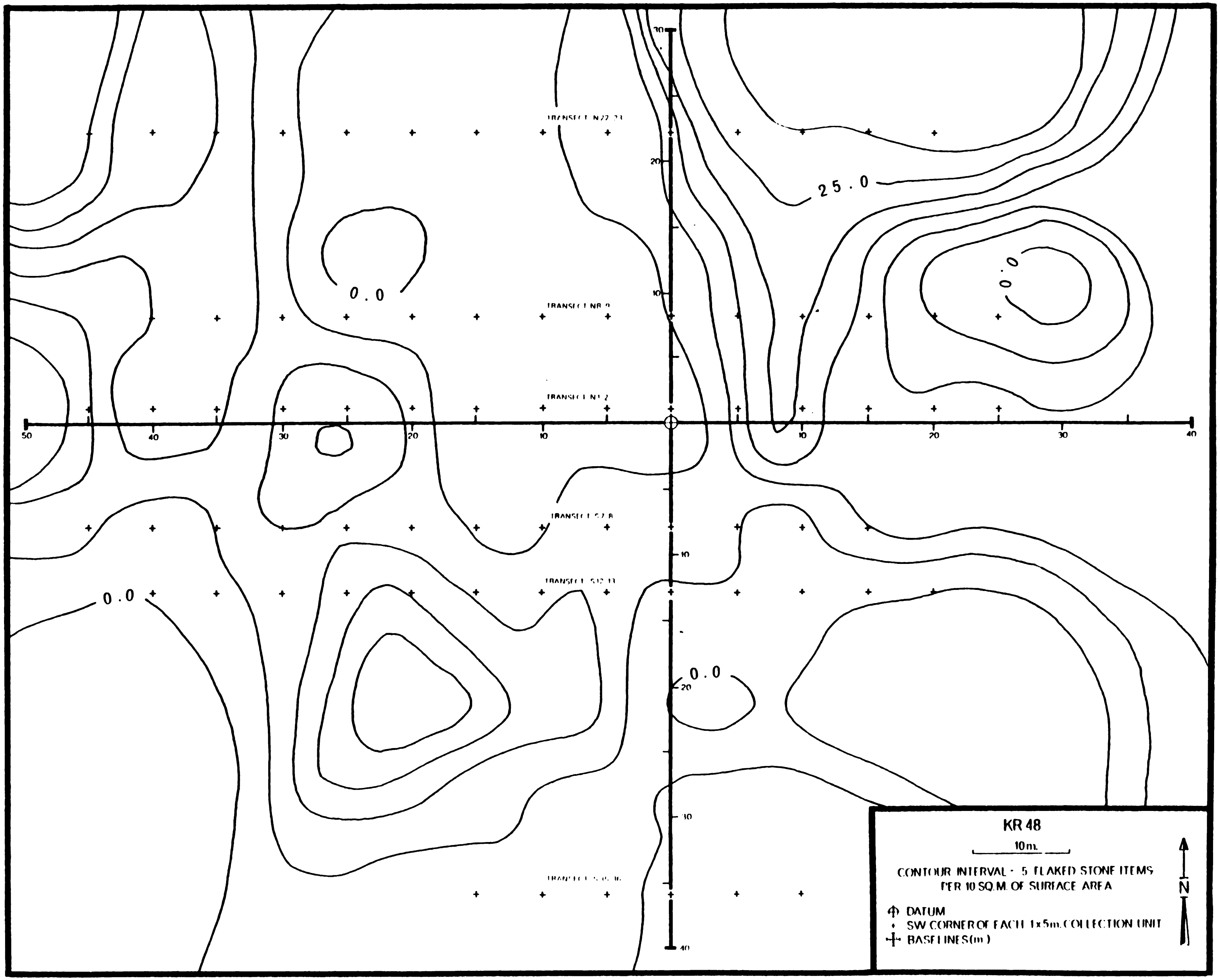
Projectile Points

The base of a single Sierra Concave Base projectile point was recovered from the southeastern quadrant.

Plate 6. Jeep trail bisecting the main site area of KR-48.


KR-48
10m.
CONTOUR INTERVAL 1m.
DATUM
BASELINES (m.)
FLAKED STONE SCATTER
PACIFIC CREST TRAIL
DIRT ROAD
N
+4
+3
+2
+1
0
-1
-2
-3
40
30
20
10

Map 10



Map 11. Surface flaked stone density at KR-48

Beads

One translucent, cobalt blue glass bead was collected from the northwest quadrant (see Appendix 1).

TEMPORAL PLACEMENT

Only two time sensitive artifacts were collected at KR-48. One is a fragment of a Sierra Concave Base projectile point, which suggests an initial occupation sometime during the Canebrake Phase (1200 B.C. - A.D. 600). The other artifact is the blue glass bead, indicating a protohistoric/historic occupation sometime after A.D. 1816 (Gibson 1975). The apparent occupational hiatus indicated by these two artifacts may be more a result of the paucity of time sensitive items than actual aboriginal behavior.

SUMMARY AND FUNCTIONAL IMPLICATIONS

KR-48, although situated in a pinyon-juniper woodland is devoid of the vegetal processing equipment and/or rock ring features which are generally diagnostic of the temporary pinyon stations that occur along the Bear Mountain Segment of the Pacific Crest Trail. In addition, KR-48 lacks the ashy midden deposits which are thought to be the result of the burning and roasting activities associated with the pinyon harvest.

KR-48 does possess a moderate density of flaked stone consisting of a relatively large number of modified flakes. In addition, three projectile point and point fragments were recovered. This would suggest that KR-48 functioned almost exclusively as a temporary hunting and/or butchering locality.

Table 24

KR-48. Distribution and Quantities of Surface Artifacts

	N1	N2	N22	S8	S13	S36	NW Quad	NE Quad	SE Quad	Total
Chalcedony										
Unmodified Flakes	-	1	2	1	-	-	-	-	-	4
Basalt										
Unmodified Flakes	-	-	1	-	-	-	-	-	-	1
Obsidian										
Bifacial Tools	1	-	2	3	-	-	-	1	-	7
Modified Flakes	14	5	15	8	6	4	-	-	-	52
Unmodified Flakes	113	97	188	76	81	36	-	-	-	591
Core Shatter	-	-	1	-	-	-	-	-	-	1
Projectile Points										
Sierra Concave Base	-	-	-	-	-	-	-	-	1	1
Unclassifiable Fragments	-	-	1	1	1	-	-	-	-	3
Beads	-	-	-	-	-	-	1	-	-	1

KR-64

Several sites, including KR-48 and KR-64, are located on the mountainous northwest exposed face of a watershed that encompasses Bear Mountain and Chimney Peak. KR-64 is situated on a small saddle at an elevation of 2110 m (6880 ft), overlooking a broad meadow area in the drainage below. Within this meadow, which was formed by the chaining of pinyon forest by the Bureau of Land Management, there exists a spring. This spring is approximately one kilometer from KR-64.

Vegetation at the site and in the surrounding area is predominately a dense cover of pinyon pine. Other vegetation observed at KR-64 includes sage and rabbit brush as well as assorted grasses.

THE SITE

KR-64 consists of a moderately dense flaked stone scatter as well as substantial midden deposit (Map 12). Unfortunately, a jeep road and turnout constructed through the site has severely disturbed both the surface assemblage and subsurface deposits. Much of this disturbance is confined to the northern half of the site. While road cuts have displaced much of the midden at KR-64, an apparently undisturbed area exists in the southeastern portion of the site. This area was selected for purposes of a text excavation.

Overall site size as determined by the extent of the flaked stone scatter is approximately 50 x 40 m or 2000 m^2 of surface area. The Pacific Crest Trail is located several meters to the northeast along a drainage face below the saddle occupied by KR-64.

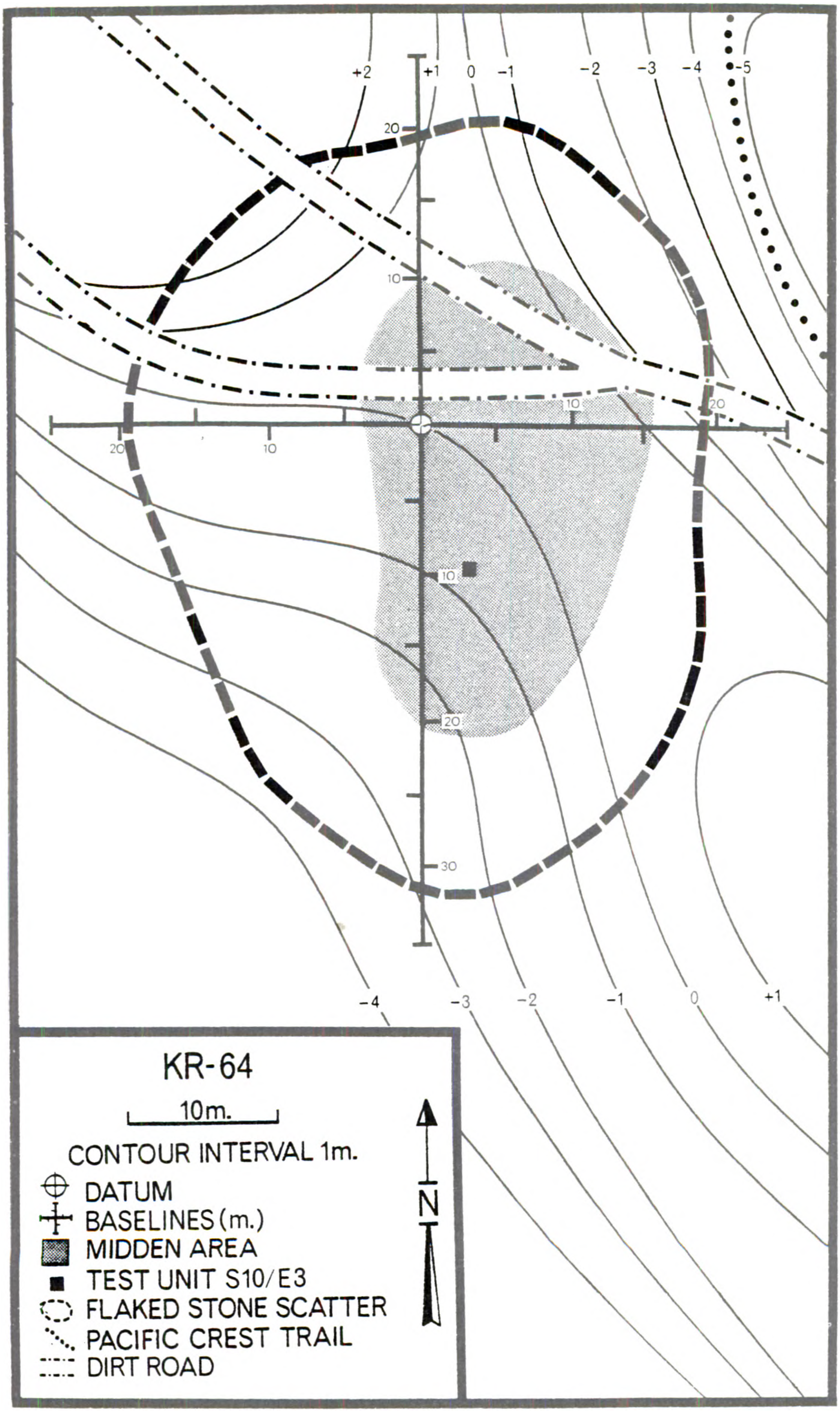
SURFACE COLLECTION

Due to the relatively high flaked stone density at KR-64 the collection of a 10% surface sample was undertaken. A north-south base line bisecting the site was extended from a centrally located datum point. Six randomly selected transects oriented in an east-west direction were collected. Each 1 m wide transect was divided into a series of five meter sections. Each section was collected as separate analytical units. A total of 170 m^2 of site surface area was collected in this fashion.

In addition, the entire site was surveyed for the purpose of collecting any time sensitive artifacts and portable milling equipment, both of which are particularly susceptible to unauthorized collection. Only two metate fragments, located in the northwest quadrant were collected in this fashion.

Flaked Stone

A total of 616 flaked stone items was recovered from the random surface sample at KR-64 (Table 25). This represents an average flaked stone density of 352/100 m^2 of site surface area. This assemblage consists primarily of modified and unmodified obsidian flakes, although a small


+2
+1
0
-1
-2
-3
-4
-5
20
10
10
20
20
10
10
20
30
-4
-3
-2
-1
0
+1
KR-64
10m.
CONTOUR INTERVAL 1m.
DATUM
BASELINES (m.)
MIDDEN AREA
TEST UNIT S10/E3
FLAKED STONE SCATTER
PACIFIC CREST TRAIL
DIRT ROAD
N

Map 12

number of bifacial tools, core fragments, and projectile point fragments were also recovered.

Much of the flaked stone material occurs in discrete concentrations within the site. These areas are graphically represented in the computer-assisted flaked stone density map on the following page (Map 13).

Ground Stone

Two small slate slabs exhibiting unifacial pecking and grinding were recovered from the surface of KR-64. These artifacts were inferred to have been "rub" stones (see Ground Stone section). In addition, a unifacial granite metate fragment measuring 18 cm x 13 cm x 3 cm was recovered from the northwest quadrant.

Arrowshaft Straightener

An artifact interpreted to be an arrowshaft straightener was recovered from transect N8-9 m. Made of porous volcanic material, it is rectangular in shape (2.0 x 3.0 cm), and possesses a single longitudinal groove.

EXCAVATION

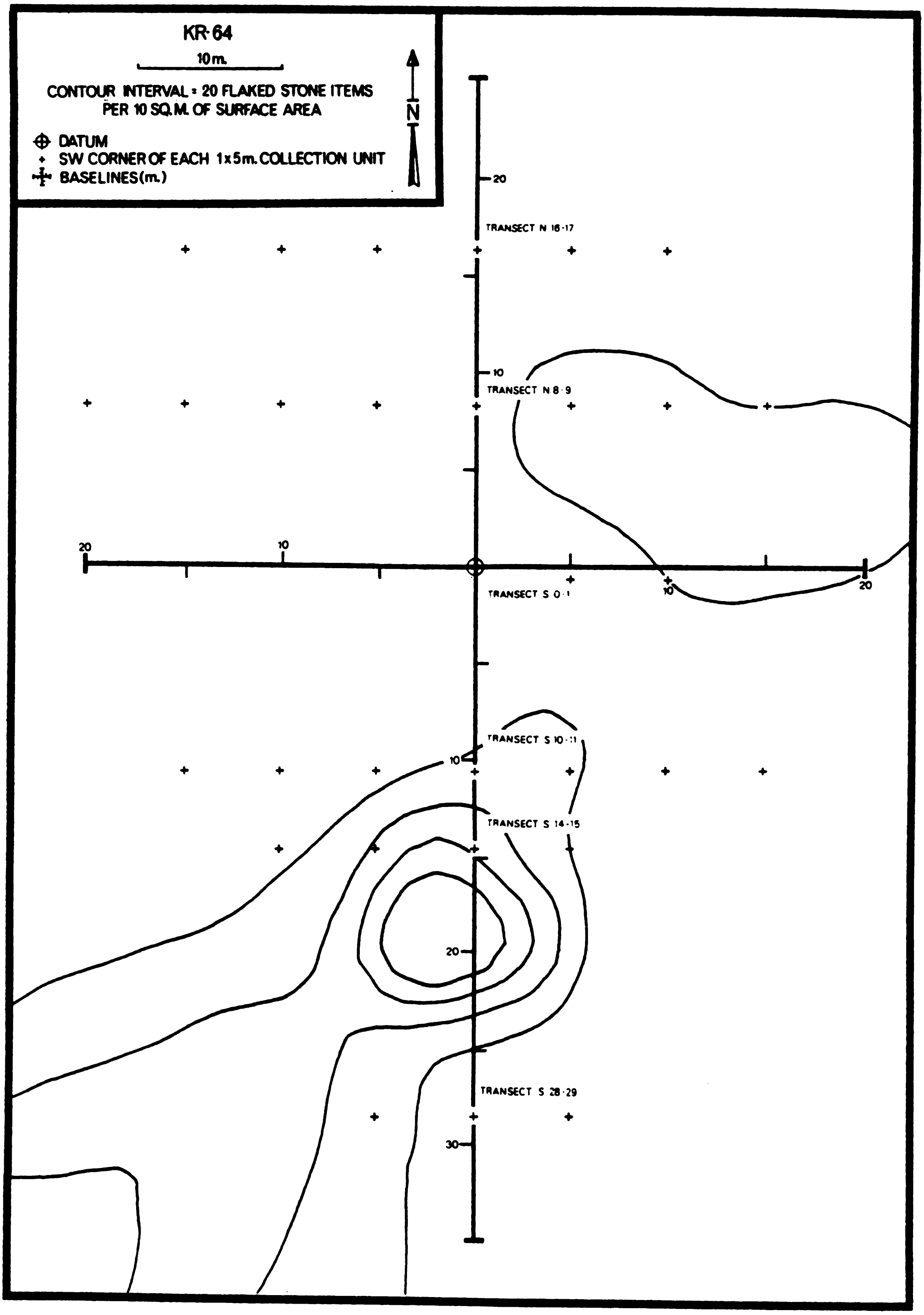
A single 1 m^2 test unit, S10/E3, was excavated in southeast area of the site. This portion of the site contained a dark midden area and also appeared to be the least disturbed. The test unit was excavated in arbitrary 10 cm levels, and all deposit was screened through 1/8 inch mesh.

Stratigraphy

Two depositional layers were evident in the 50 cm of deposit excavated at test unit S10/E3. The first 35 cm of deposit was a homogenous, loosely packed, grey-brown midden (Munsell color 10YR 3/2). At 35 cm the deposit began to slowly grade to a yellowish, compacted, decomposing granite terminating at sterile decomposing granite at 50 cm (Munsell color 10YR 4/2 at 40-50 cm).

Flaked Stone

A total of 1273 flaked stone items was recovered from test unit S10/E3. All but nine of these specimens were of obsidian while the remainder consisted of chalcedony and basalt. The vast majority of this assemblage consists of unmodified flakes with a small number of modified flakes and bifacial tools (Table 26). Aside from flaked stone no other artifactual material was recovered from test unit S10/E3.



Map 13. Surface flaked stone density at KR-64

Plant Macrofossils

An analysis of charred plant macrofossils from test unit S10/E3 resulted in the following identifications:

S10/E3	10-20 cm	-	eight pinyon cone scales.
	20-30 cm	-	three pinyon cone scales, one pinyon cone axis.

TEMPORAL PLACEMENT

The following source-specific obsidian hydration dates were obtained from test unit S10/E3:

Level	Cat. Number	Rim Value (Microns)	Date
0-10 cm	64-106	2.12	A.D. 1101
20-30 cm	64-134	2.35	A.D. 1016
30-40 cm	64-141	1.81	A.D. 1217

The above dates would suggest a late Sawtooth Phase (A.D. 600 - 1300) occupation of KR-64. Unfortunately the sample of dates is small; other occupation phases may simply have not been presented.

No other temporally diagnostic artifactual material was recovered from KR-64.

SUMMARY AND FUNCTIONAL IMPLICATIONS

Several lines of evidence suggest the importance of pinyon procurement at KR-64. This is primarily manifest in the recovery of three metate fragments. As mentioned in the Ground Stone section of this report, metates were primarily used in the hulling and milling of pinyon nuts. The importance of pinyon exploitation is further attested to by both the environmental context of KR-64 and the recovery of a number of pinyon seed and cone parts from the deposit at test unit S10/E3.

The recovery of a number of flaked stone tools and projectile point fragments, as well as an arrowshaft straightener, suggests that many activities associated with hunting were also occurring at KR-64. Yet. the complete lack of subsurface faunal material would seem to indicate that these hunting related activities did not include the on-site consumption of animal resources. While KR-64 may have occasionally served as a locus of hunting activity, it is hypothesized that most preparation and consumption of animal products occurred at the larger pinyon base camps (see Faunal Analysis section).

It is inferred that the surprising depth of the midden deposit (50 cm) at KR-64 is not so much the result of habitation activity, but more likely is due to the number of burning and roasting activities associated with pinyon preparation (see Ethnographic section).

In conclusion, it is suggested that KR-64 is representative of a particular subsistence-settlement type: the temporary pinyon station.

Table 25

KR-64. Frequencies of Artifacts from Surface Transects

	N 8-9 m	N 16-17 m	S 0-1 m	S 10-11 m	S 14-15 m	S 28-29 m	Total
Chalcedony							
Unmodified Flakes	1	-	1	-	5	-	7
Obsidian							
Bifacial Tools	2	-	1	-	2	-	5
Modified Flakes	18	3	1	7	10	11	50
Unmodified Flakes	85	37	40	122	212	50	546
Core Fragments	1	-	-	-	3	-	4
Projectile Points							
Unclassifiable Fragments	1	-	-	3	-	-	4
Ground Stone Tools							
Metate Fragment	-	1	-	-	-	-	1
Arrowshaft Straightener	1	-	-	-	-	-	1

Table 26

KR-64. Distribution and Frequencies of Subsurface Artifacts

Unit S10/E3

	0-10	10-20	20-30	30-40	40-50	Total
Chalcedony						
Unmodified Flakes	4	-	-	3	1	8
Basalt						
Unmodified Flakes	-	-	-	-	1	1
Obsidian						
Bifacial Tools	1	-	-	1	-	2
Modified Flakes	7	6	3	3	1	20
Unmodified Flakes	523	284	212	143	74	1236
Core Fragments	2	1	-	2	-	5
Projectile Points						
Point Fragments	1	-	-	-	-	1

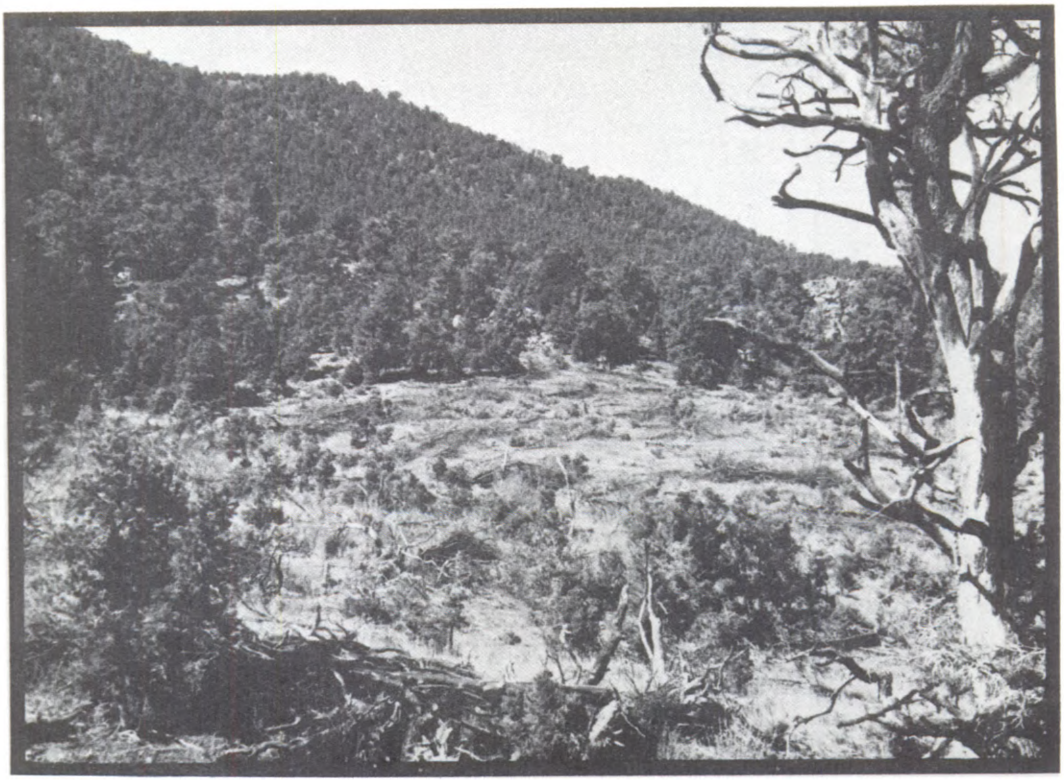
Introduction to KR-46, -60, -44, -43

The section of the Pacific Crest Trail that includes KR-46, -60, -44, and -43, runs along the lower portion of an unnamed mountain ridge. At several points along this trail, granitic outcrops form small knolls perpendicular to the ridge. Invariably, a small flat saddle exists between these granitic knolls and the larger mountain ridge. KR-46, -60, -44, and -43 are situated on these knolls and saddles (Plate 8).

Situated as they are, adjacent to prominent granitic knolls, these sites provide a wide panorama of the small valley below. The vegetation in this valley has been severely disrupted by government chaining of what once was a lush pinyon woodland (Plate 7).

KR-46, -60, -44, and -43 all lie within approximately 500 meters of each other and occupy almost identical landforms; all are situated in a dense pinyon-juniper woodland. Not surprisingly, the archaeological structure of these four sites is quite similar, manifesting what may be a distinctive settlement-type: the temporary pinyon camp.

Plate 7. View from KR-46 looking toward KR-60, -44, and -43 which lie just above the forest edge. The meadow in the foreground is the result of forest chaining operations conducted by the Bureau of Land Management.



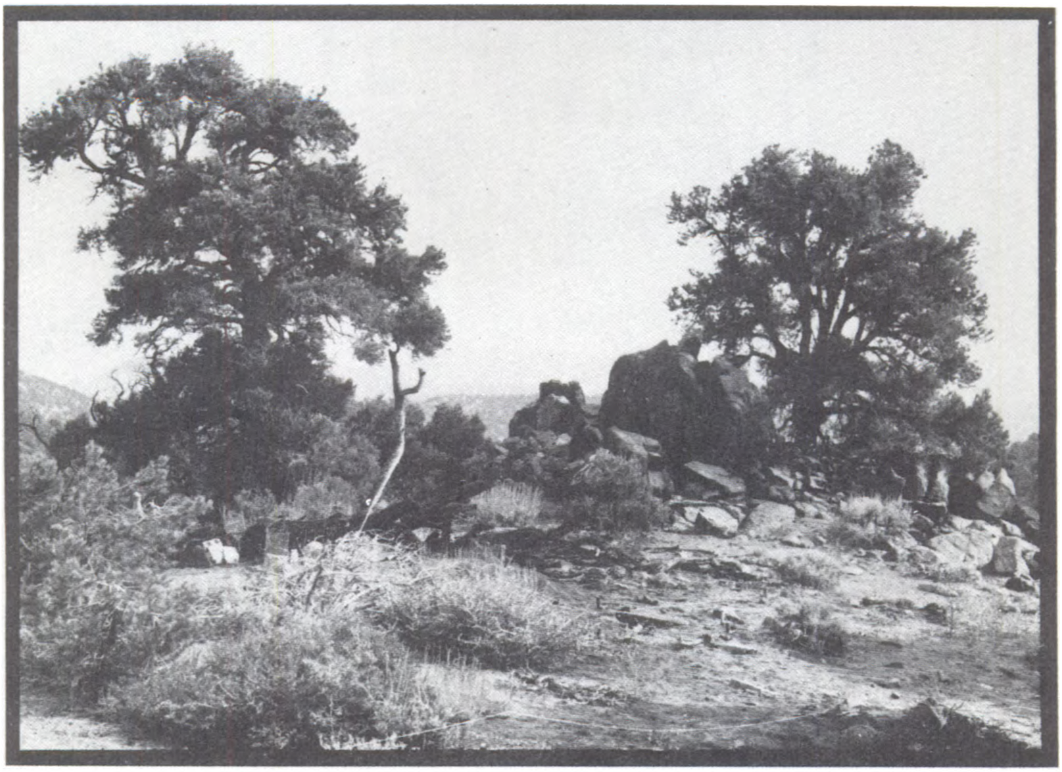


Plate 8. Flat saddle area upon which KR-60 is located.

KR-46

KR-46 is located on a prominent knoll overlooking a large drainage (Map 14). The knoll is situated at 2195 m (7200 ft) elevation and is composed of a series of rugged granitic outcrops. A government program of range clearance involving the chaining of pinyon-juniper woodland has stripped the forest vegetation on all sides of the site boundaries. Thus the site area of KR-46 has the appearance of a small island of pinyon forest protruding out of a meadow (Plate 9). Along with pinyon, vegetation at KR-46 includes juniper, sagebrush, flannel bush, rabbit brush, beavertail, and assorted grasses. Although the knoll has not been affected by the chaining operation, it appears that part of the original site may have included certain areas that now lie in the disturbed chained area.

The nearest observable permanent water sources is located approximately one kilometer to the southeast.

THE SITE

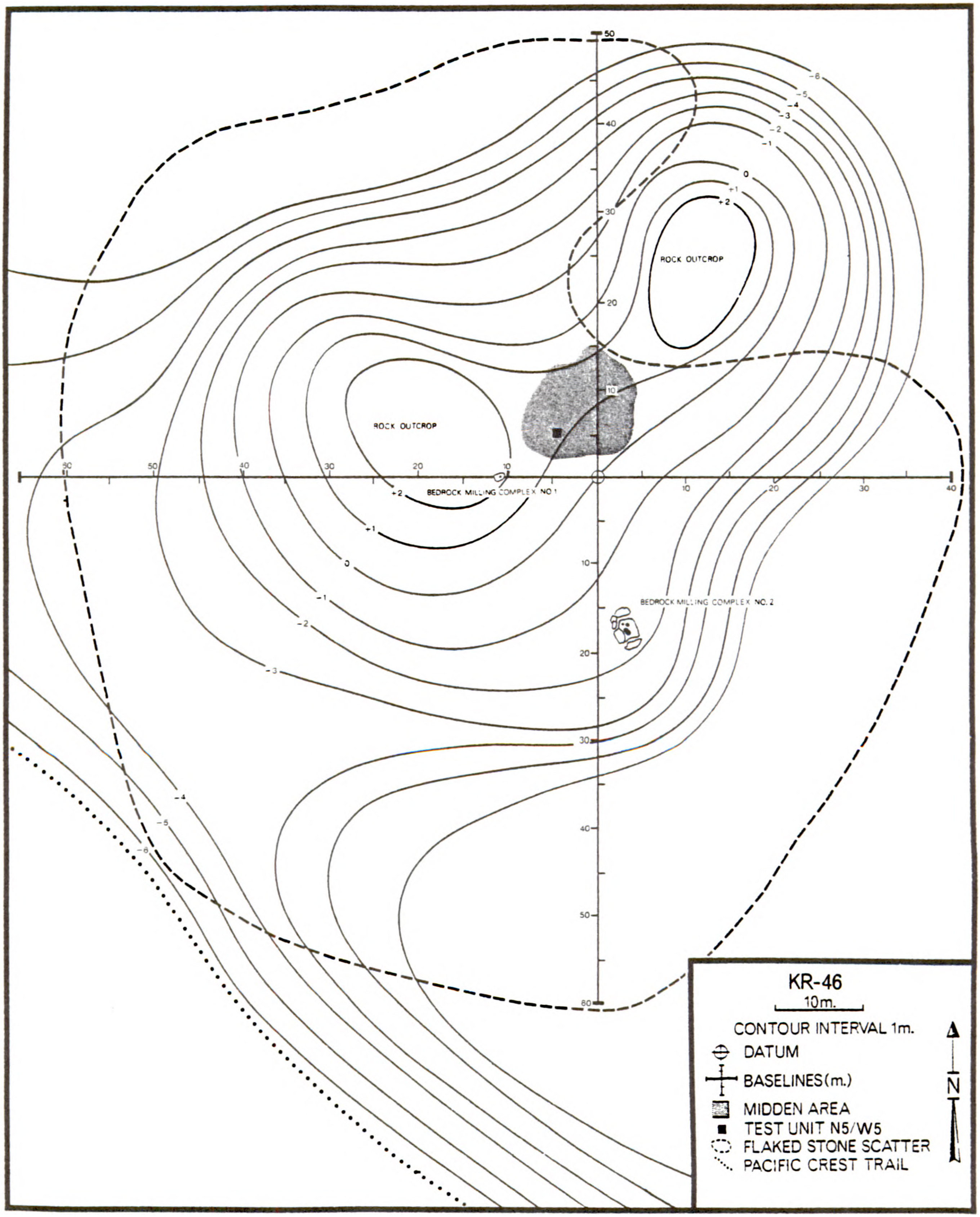
KR-46 is an extremely diffuse flaked stone surface scatter with dimensions of approximately 135 x 110 m (7790 m^2). The surface flaked stone assemblage generally appears to be most concentrated toward the top of the knoll. On top of the knoll, in a small flat area, there is a small pocket of darkened soil approximately 25 m^2 in surface area. Two bedrock milling areas containing a total of one mortar and four slicks were also observed at KR-46.

SURFACE FEATURES

Two bedrock milling complexes were the only surface features encountered at KR-46. Ten meters west of the datum a single grinding slick is located on a granite boulder (Bedrock Milling Complex 1). The slick is ovoid measuring 32 x 26 cm. Approximately 15 m southeast of the datum point there is a granitic outcrop containing 3 grinding slicks and a single mortar (Bedrock Milling Complex 2). These slicks are generally ovoid in shape with varying lengths and widths: 77 x 50 cm, 47 x 33 cm, and 15 x 25 m. The mortar is shallow, with a depth of 2 cm and a diameter of 13 cm.

SURFACE COLLECTION

Surface reconnaissance of KR-46 revealed both a midden deposit and slight concentration of flaked stone material toward the top of the knoll. A datum point on the granite boulder was selected at this central location. A north-south as well as an east-west axis line were laid out for the length of the site. All surface artifacts were then collected according to their quadrant provenience. The results of this surface collection are contained in Table 27.


ROCK OUTCROP
ROCK OUTCROP
BEDROCK MILLING COMPLEX NO.1
BEDROCK MILLING COMPLEX NO. 2
KR-46
10m.
CONTOUR INTERVAL 1m.
DATUM
BASELINES(m.)
MIDDEN AREA
TEST UNIT N5/W5
FLAKED STONE SCATTER
PACIFIC CREST TRAIL
N

Map 14

Plate 9. Site area of KR-46 as viewed from the northwest. Meadow area is the result of forest chaining operations conducted by the Bureau of Land Management.

Flaked Stone

As can be seen in Table 27 the vast majority of flaked stone artifacts at KR-46 are of obsidian. Only 8 of the 665 flaked stone artifacts were of a basalt. A number of bifacial tools as well as modified and unmodified flakes were recovered from the surface. Overall surface flaked stone density is relatively low, averaging only 9 artifacts/100 m^2.

EXCAVATION

Original Government surveys did not record the presence of midden deposits at KR-46 (Montizambert 1978). Upon discovery of a small area of soil discoloration at the top of the knoll the Government approved excavation of a single 1-m^2 test unit. The test unit (N5/W5) was centrally located within the discolored area. The unit was then excavated in arbitrary 10-cm levels; all deposit was screened through 1/8-inch mesh.

Stratigraphy

Four depositional layers were evident in the 80 cm of deposit excavated at test unit N5/W5. A 2-3 cm overburden layer of light-gray granitic gravel covered approximately 30 cm of a dark gray-brown deposit (Munsell color 10YR 4/2). At about 30-35 cm the deposit began to grade into a more compacted yellowish soil (Munsell color 10YR 5/3) at 30 cm level). This trend continues until a terminal level of decomposing granite was encountered 80 cm below the surface (Munsell color 70YR 5/4).

Flaked Stone

The only subsurface artifacts encountered in test unit N5/W5 were flaked stone materials, of which 765 items were of obsidian and 3 of chalcedony. Only 2 obsidian flakes showed any sign of use. Subsurface data from unit N5/W5 is summarized in Table 28.

Charred Plant Remains

The following identifiable charred seed parts and cone remains were obtained from test unit N5/W5:

N5/W5	10-20 cm	6 pinyon cone scales
	20-30 cm	pinyon cone scale fragments
	40-50 cm	1 pinyon cone axis
	70-80 cm	1 pinyon cone scale.

TEMPORAL PLACEMENT

The following source-specific obsidian hydration dates were obtained for test unit N5/W5 at KR-46.

Level	Cat. Number	Hydration Rim (Microns)	Date
0-10	46-108	3.53	A.D. 614
10-20	46-111	4.04	A.D. 431
20-30	46-114	3.43	A.D. 650
30-40	46-118	3.60	A.D. 588
40-50	46-120	4.54	A.D. 253
50-60	46-121	3.63	A.D. 578
60-70	46-124	4.14	A.D. 385

As can be seen above all dates cluster between A.D. 253 and A.D. 650. This would seem to indicate that the most intense period of occupation of KR-46 was the latter end of the Canebrake Phase (1200 B.C. - A.D. 600). No other datable material was recovered from KR-46.

Table 27

KR-46. Distributions and Quantities of Surface Artifacts

	NW Quad	SW Quad	NE Quad	SE Quad	Total
Basalt					
Bifacial Tool	-	1	-	-	1
Unmodified Flakes	3	3	-	-	6
Obsidian					
Bifacial Tools	2	2	1	2	7
Modified Flakes	15	23	5	6	49
Unmodified Flakes	213	181	54	153	601
Core Shatter	5	4	-	2	11
Projectile Points					
Unclassifiable Fragment (basalt)	-	1	-	-	1

Table 28

KR-46. Distribution of Subsurface Artifacts and Ecofacts

Unit N5/W5

Bone Fragments	0-10	10-20	20-30	30-40	40-50	50-60	60-70	70-80	Total
<u>Chalcedony</u>									
Unmodified Flakes	1	-	2	-	-	-	-	-	3
<u>Obisidian</u>									
Modified Flakes	-	-	-	1	-	1	-	-	2
Unmodified Flakes	120	88	201	105	124	60	48	16	762
Core Shatter	1	-	-	-	-	-	-	-	1

KR-60

Much like KR-43, -44, and -46, KR-60 is located on a comparatively flat landform adjacent to a relatively large granitic outcrop. This outcrop and flat landform are perpendicular on an east-west axis to a larger ridge that runs in a north-south direction. Small, intermittent drainages border the flat area and granitic outcrop on the north and south. To the east, KR-60 commands a wide view of a small valley.

Pinyon-juniper woodland is the predominate vegetation cover of KR-60 and the surrounding area. Sagebrush and various grasses were also observed on the site. The nearest water source is situated 1 km to the southeast.

THE SITE

KR-60 is a relatively complex site possessing a flake stone scatter, midden, rock ring features, and bedrock milling complexes (Map 15). The flaked stone scatter does not extend through the entire site but is confined to about a 300 m^2 area of the flat area directly west of the granite outcrop. A small midden deposit (200 m^2) was also located in this same vicinity.

Marking the northern and southern perimeter of KR-60 were three rock ring features. Three loci of bedrock milling activity as well as several surface specimens of portable milling equipment were also observed at KR-60.

The Pacific Crest Trail runs along the western perimeter of KR-60 but does not appear to have seriously disturbed the integrity of the site.

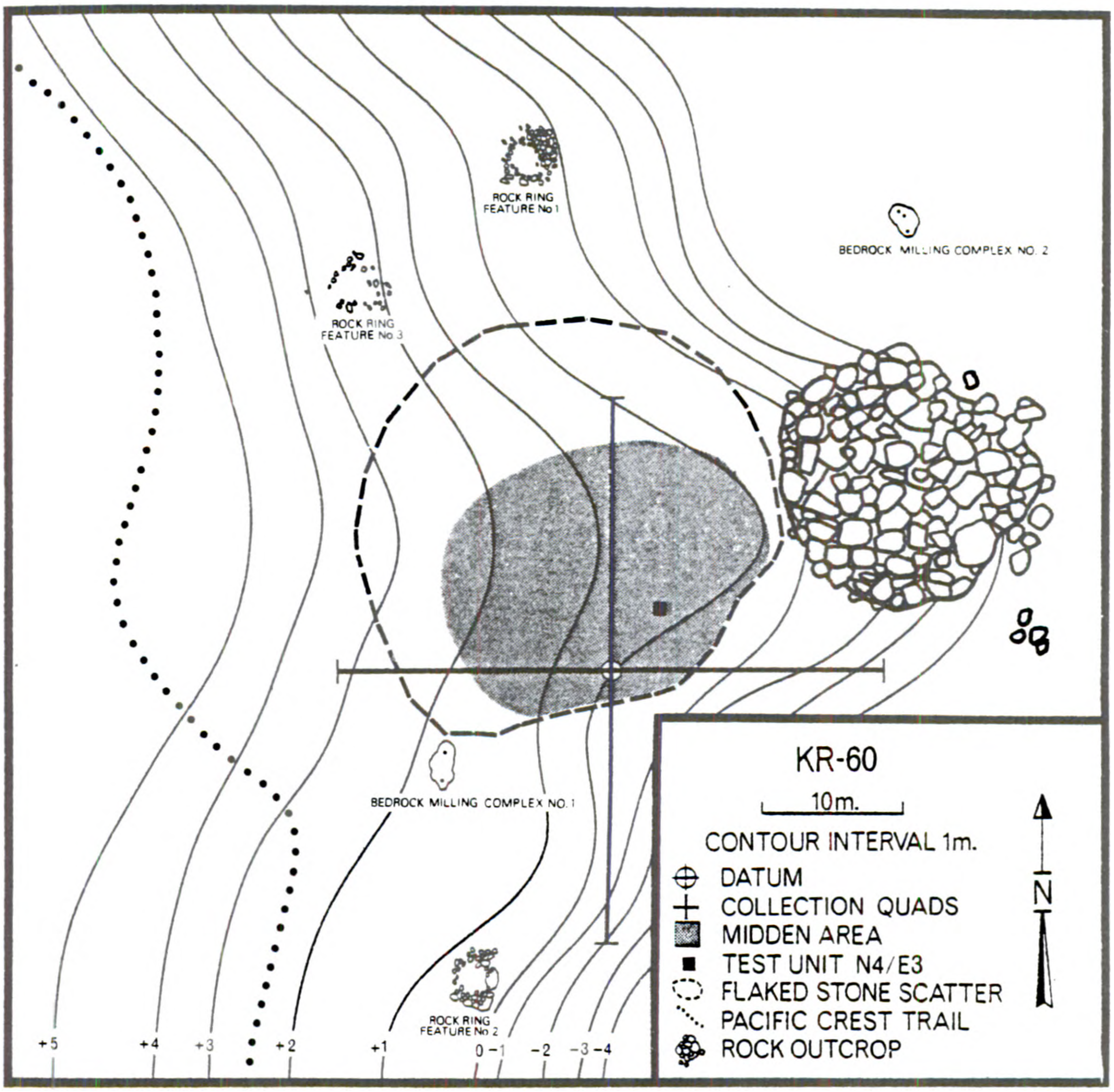
SURFACE FEATURES

Rock Rings

Rock ring features 1 and 3 are located on the northern periphery of KR-60. Rock ring feature 1 is on a small, slightly sloping (≈ 10%) granitic terrace. Although its interior diameter varies from 2 to 3 m, a large agglomeration of granite rocks forming the western side of the ring gave it an exterior diameter of 7 m (Figure 8) (Plate 13). No other surface artifactual material was associated with this feature.

Eight meters west of rock ring feature 1 is rock ring feature 3. This rock ring possesses a similar interior diameter (3.0-3.7 meters) but is much less robust; just a single course of granite rocks was used in its construction (Figure 10). No other surface artifactual material was associated with rock ring feature 3.

On a small granite terrace in the southern periphery of KR-60 is rock ring feature 2 (Figure 9). The average interior diameter of this feature is about 2.0-2.3 m. Several obsidian flakes were observed in the interior of the ring, and a bedrock grinding slick was located on the southern perimeter of the feature.


ROCK RING FEATURE No 1
BEDROCK MILLING COMPLEX NO. 2
ROCK RING FEATURE No 3
BEDROCK MILLING COMPLEX NO. 1
ROCK RING FEATURE No 2
+5
+4
+3
+2
+1
0
-1
-2
-3
-4
KR-60
10m.
CONTOUR INTERVAL 1m.
DATUM
COLLECTION QUADS
MIDDEN AREA
TEST UNIT N4/E3
FLAKED STONE SCATTER
PACIFIC CREST TRAIL
ROCK OUTCROP
N

Map 15

Bedrock Milling Complexes

In addition to the single bedrock grinding slick associated with rock ring feature 2, two other bedrock milling areas were observed at KR-60. Located approximately 10 m southwest of the datum point is a large boulder with two bedrock mortars (Bedrock Milling Complex 1). The mortars possess diameters of 10.0 cm and 4.5 cm with depths of 2.5 cm.

Approximately 30 m northeast of the datum is a large boulder possessing three bedrock mortars (Bedrock Milling Complex 2). These mortars are uniformly shallow (2.0-3.5 cm) with diameters of 8.0, 11.0, and 12.1 cm.

SURFACE COLLECTION

A very low density of surface artifacts was observed at KR-60. Most of this material was concentrated directly west of the granite outcrop. A datum point which was centrally located within the flaked stone scatter was selected. A north-south and east-west line were constructed from the datum point extending the length of the site. All surface artifacts were then collected according to quadrant provenience. The results of this surface collection are contained in Table 29.

Flaked Stone

Only 99 flaked stone items were recovered from the surface of KR-60: more than half of these came from the southeast quadrant. A total of 9 specimens were of chalcedony material while the rest were of obsidian. Modified flakes and bifacial tools comprised 37% of all flaked stone material recovered from KR-60. Overall density of the flaked stone scatter at the site was approximately 33 flakes/100 m^2 surface area.

Projectile Point

A single Cottonwood Triangular projectile point was recovered from the northwest quadrant.

Ground Stone

Two ground stone tools were located on the surface of KR-60. These included a metate fragment situated in the northwest quadrant, and a pestle from the southwest quadrant.

Beads

Two glass trade beads were recovered from KR-60: a faceted, cobalt blue bead from the northwest quadrant, and a translucent red/opaque center bead from the northeast quadrant.

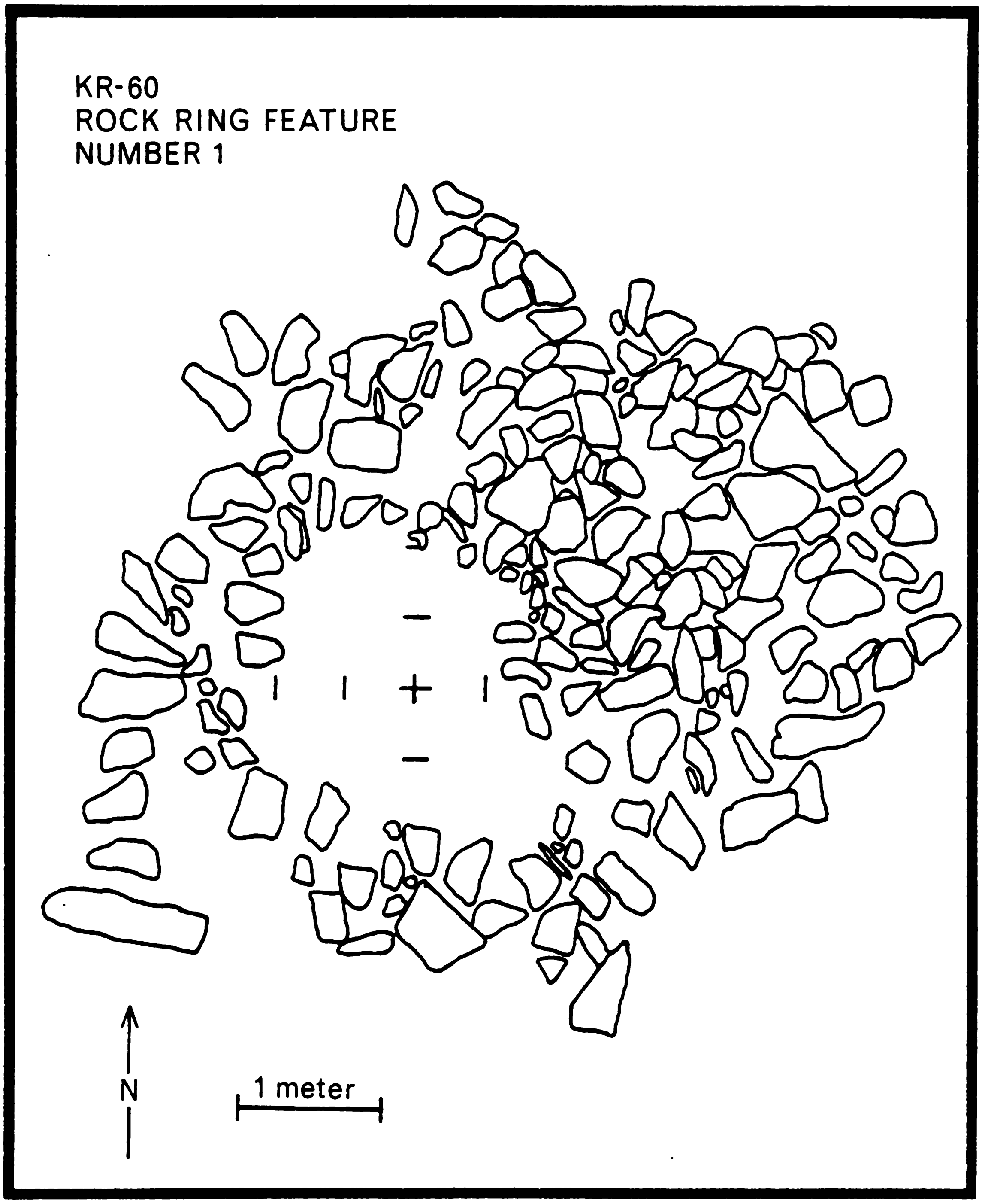


Figure 8

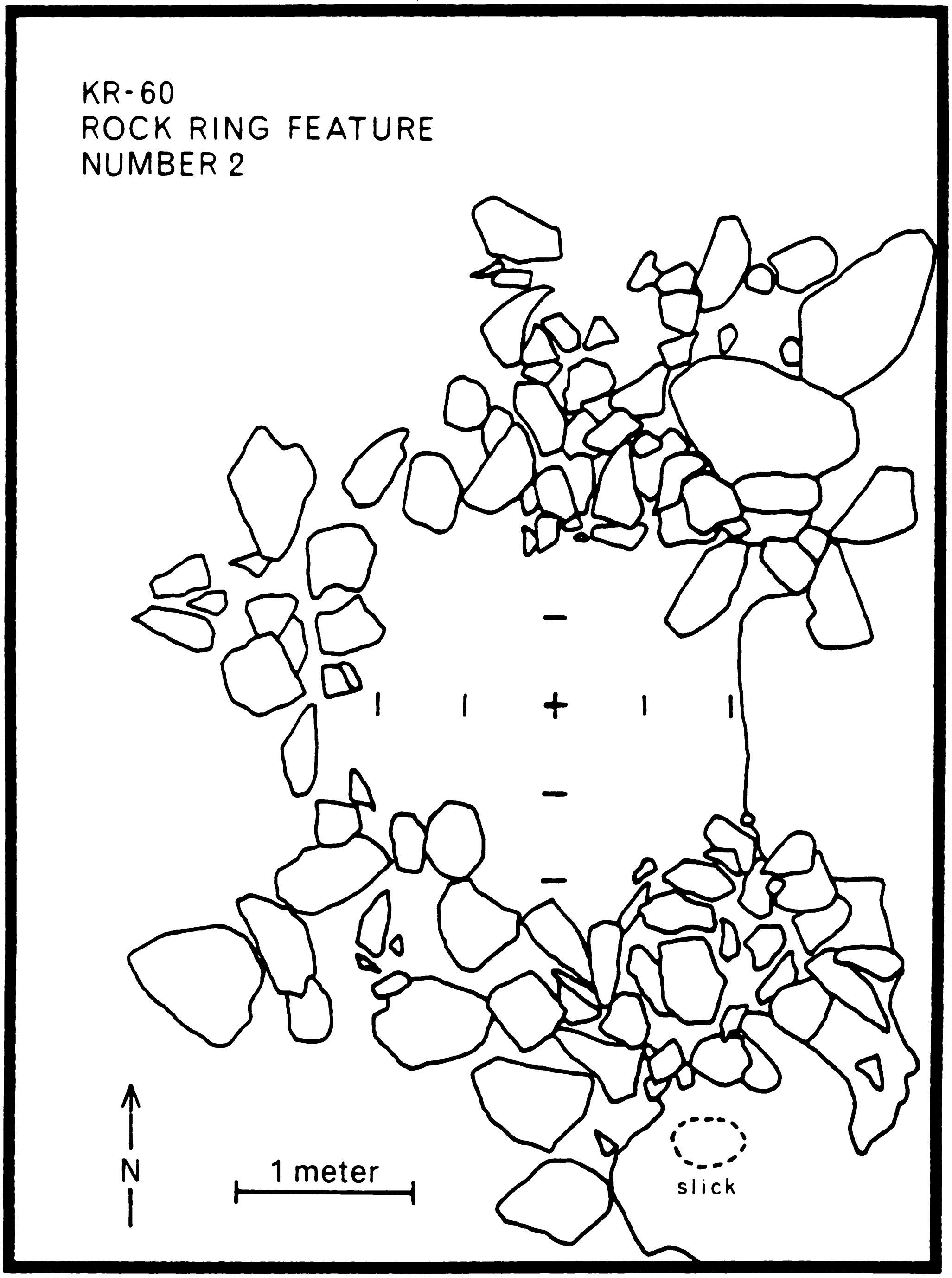


Figure 9

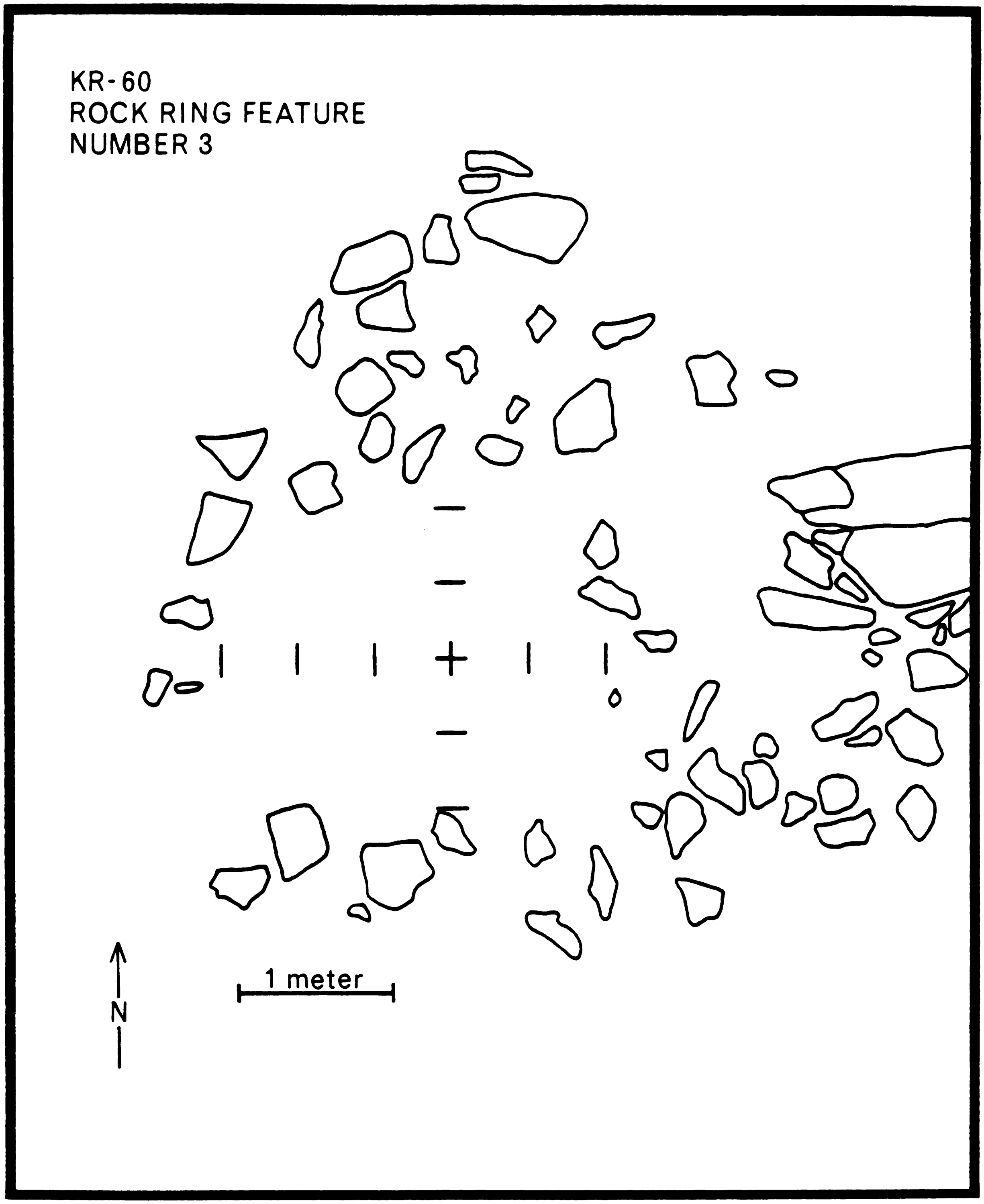


Figure 10

EXCAVATION

A single 1-m^2 test unit, N4/E3, as well as the interiors of the three rock ring features were excavated at KR-60. The location of unit N4/E3 was selected according to the greatest surface indications of midden deposit (e.g., degree of soil discoloration, flaked stone concentration). The rock ring features were divided along a north-south axis; and one-half of the interior deposit was excavated. In addition, the rock rings were excavated as features with their interior perimeters demarcating the excavation sample.

Stratigraphy

Test unit N4/E3 exhibited only 15 cm of dark gray-brown midden deposit (Munsell color 10YR 4/2) before abruptly terminating at decomposing granite. The deposit contained a large quantity of charcoal yet was essentially devoid of subsurface artifactual material.

The interior depositional characteristics of the rock ring features exhibited general similarity. Artifactual material, if any, as well as small amounts of charcoal were concentrated in the slightly darker upper 10 cm of deposit. In the cases of rock ring features 1 and 3 this was followed by 10-20 cm of a compacted, yellowish deposit (Munsell color 10YR 5/3, 5/4) before terminating at decomposing granite. Rock ring feature 2 exhibited a slightly more uniform grayish brown deposit (Munsell color 10YR 4/3) extending 10-25 cm before terminating abruptly on granite bedrock.

SUB-SURFACE FEATURES

All three rock ring features are located near the periphery of KR-60 and appear to have been purposely constructed on a granite substrate. This was especially apparent upon excavation of rock ring features 1 and 3, which revealed a smooth granite base ranging from 5 to 35 cm below the interior surface (Plates 12 and 13). Several large rocks which form rock ring feature 1 actually articulate directly with the granite substrate. The granite substrate would have presumably provided a pinyon cache with protection against burrowing rodents.

Very little artifactual material was recovered from either rock ring feature 1 or 3, which would seem to dispel any notion of their use as habitation structures. Paradoxically, rock ring feature 2 contained a total of 134 flaked stone items (as well as an associated bedrock grinding slick. Rock ring feature 2 may have functioned as a habitation structure (see Rock Ring Feature section).

SUB-SURFACE ARTIFACTS AND ECOFACTS

Test unit N4/E3 contained only one unmodified flake as well as a single red translucent glass trade bead (see Appendix 1).

Charred Plant Remains

The following identifiable charred plant remains were obtained from test unit N4/W3 and rock ring feature 1 and 2:

N4/W3	10-20 cm	20 pinyon and digger cone scales, 1 pinyon seed shell, 1 digger seed shell.
rock ring feature 1	10-20 cm	1 pinyon cone scale
rock ring feature 2	10-20 cm	6 pinyon cone scale fragment.

TEMPORAL PLACEMENT

The recovery of the three glass trade beads indicate a post A.D. 1816 or late Chimney Phase occupation of KR-60 (Bass and Andrews 1977). In addition, three subsurface source-specific obsidian hydration dates were obtained from rock ring features 1 and 2 and are presented below:

Level	Cat. Number	Hydration Rim (Microns)	Date
	Rock ring feature 1		
0-10 cm	60-056	5.00	A.D. 89
	Rock ring feature 2		
0-10 cm	60-059	3.30	A.D. 696
10-20 cm	60-061	2.42	A.D. 1018

As can be seen the obsidian sample size is small. Although the derived dates indicate occupation during both the Canebrake and Sawtooth Phases, this should be viewed as tentative.

Table 29

KR-60. Distribution and Quantities of Surface Artifacts

	NE Quad	NW Quad	SE Quad	SW Quad	Total
Chalcedony					
Modified Flakes	-	1	-	-	1
Unmodified Flakes	3	3	1	1	8
Obsidian					
Bifacial Tools	-	1	-	-	1
Modified Flakes	7	4	2	4	17
Unmodified Flakes	28	10	14	16	68
Core Shatter	1	-	-	-	1
Projectile Points					
Cottonwood Series	-	1	-	-	1
Unclassifiable Fragments	2	-	-	-	2
Ground Stone Artifacts					
Metate Fragment	-	1	-	-	1
Pestle	-	-	-	1	1
Miscellaneous					
Glass Beads	1	1	-	-	2

Table 30

KR-60. Distribution of Subsurface Artifacts

Unit N4/E3

	0-10	10-20	Total
Chalcedony			
Unmodified Flakes	1	-	1
Glass Bead	1	-	1

Rock Ring Feature 1

	0-10	10-20	20-30	Total
Chalcedony				
Unmodified Flakes	3	-	-	3
Core Shatter	2	-	-	2
Obsidian				
Unmodified Flakes	1	-	-	1

Rock Ring Feature 2

	0-10	10-20	20-30	Total
Chalcedony				
Unmodified Flakes	1	-	1	2
Obsidian				
Unmodified Flakes	87	40	3	130
Core Shatter	1	-	-	1

Rock Ring Feature 3

	0-10	10-20	20-30	Total
Chalcedony				
Modified Flakes	1	-	-	1

KR-44

KR-44 is located directly east of the Pacific Crest Trail on a small, flat saddle that lies between the trail and a prominent granitic outcrop. This granitic outcrop is situated at an elevation of 2234 m (7330 ft) and provides a wide panorama of the large drainage area below the site. The site is bounded to the south by a shallow drainage which separates KR-44 from the site area of KR-60 some 60 m away.

Aside from providing its aboriginal inhabitants a clear and unobstructed view of the surrounding valley, KR-44 is situated in a predominantly pinyon woodland, thus providing easy access to pine-nut resources. Other on-site vegetation includes juniper, sagebrush, flannelbush, currant, and various herbs and grasses. No permanent streams or springs were observed in the vicinity of the site; the nearest such water source is approximately one kilometer to the southeast.

THE SITE

KR-44 covers an area of about 46 x 57 m (approximately 2000 m^2). A small midden deposit encompassing an area of approximately 100 m^2 is centrally located at the lowest inflection of the saddle (Map 16). This area also contains the densest concentration of flaked stone material. The flaked stone scatter becomes progressively less dense toward the boundaries of the site. East of the main midden area are a rock ring feature and a small bedrock mortar which are located in the granitic outcrop which forms the small knoll. One other surface feature, a grinding slick, is located on a small boulder area near the western boundary of the midden.

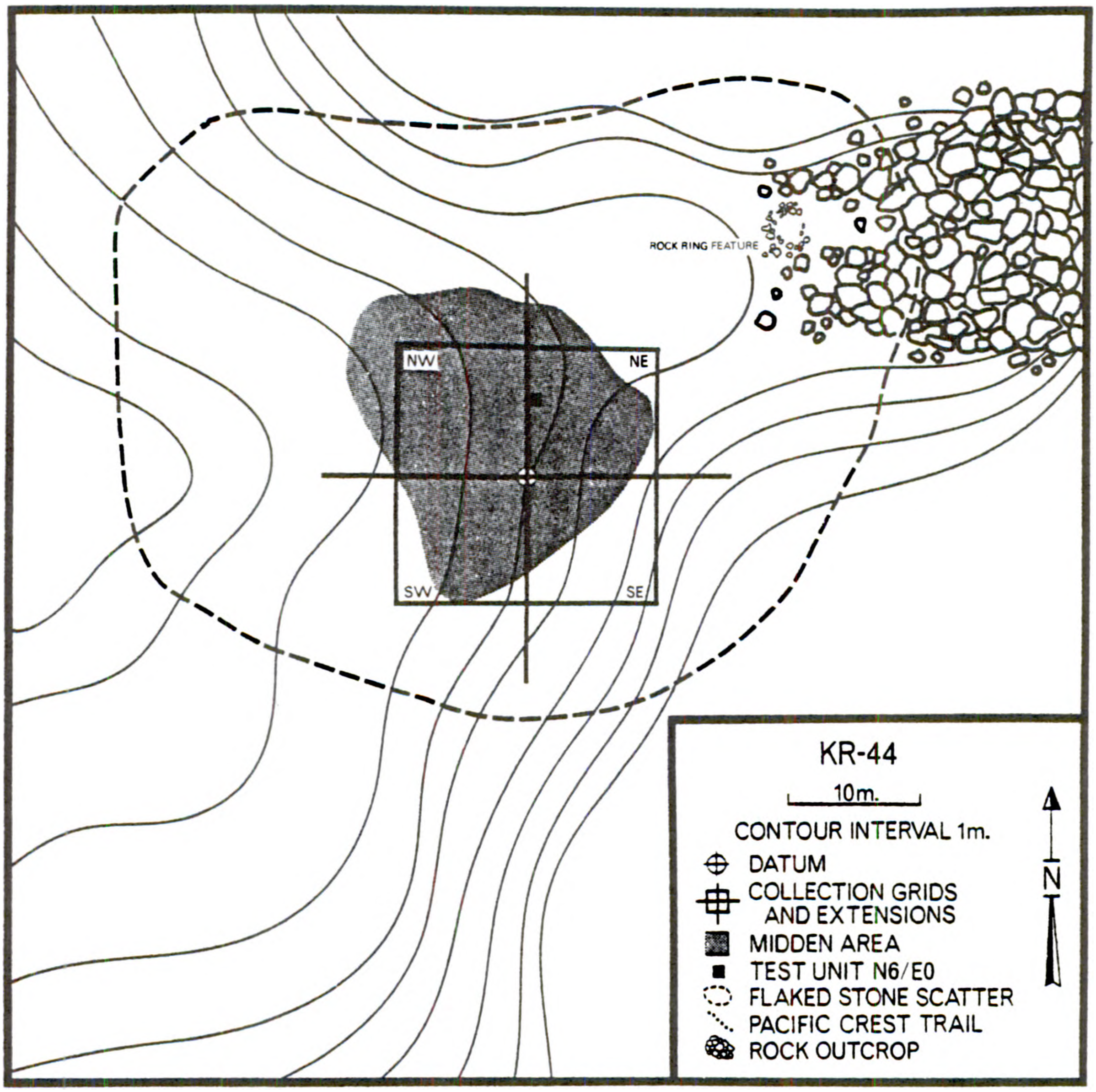
The Pacific Crest Trail skirts the western edge of the site but has not seriously disturbed its integrity. No other disturbances were observed.

SURFACE FEATURES

Two bedrock milling features as well as a single rock ring feature were observed at KR-44. The rock ring and a bedrock mortar are located in the northeast quadrant. The mortar is approximately three meters southeast of the rock ring on granitic bedrock. This circular mortar has a diameter of 13 cm and a depth of 8 cm. A pestle was found in association with this mortar. The rock ring feature is circular constructed primarily of granite boulders. Its average interior diameter is approximately two meters (Figure 11). A single ovoid bedrock grinding slick is located in a granite boulder area approximately 15 m southwest of the datum point. The slick measures 42 x 38 cm.

SURFACE COLLECTION

Surface reconnaissance of KR-44 revealed an artifact concentration centered on the location of the datum point. Four 10 x 10 m grids were constructed on a north-south, east-west axis around the datum point. All surface artifacts were then collected from these grids.


ROCK RING FEATURE
NW
NE
SW
SE
KR-44
10m.
CONTOUR INTERVAL 1m.
DATUM
COLLECTION GRIDS AND EXTENSIONS
MIDDEN AREA
TEST UNIT N6/E0
FLAKED STONE SCATTER
PACIFIC CREST TRAIL
ROCK OUTCROP
N

Map 16

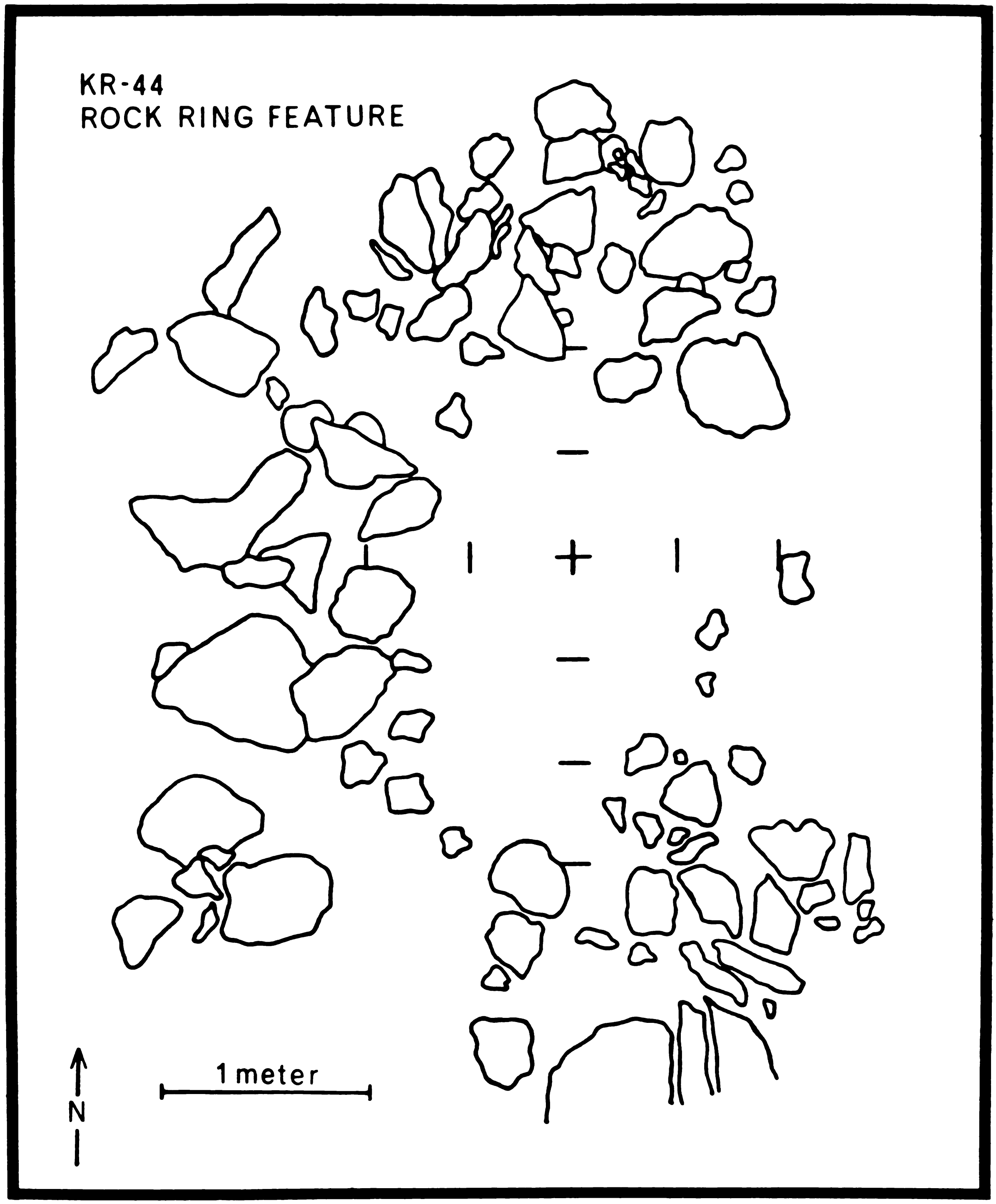


Figure 11

A very low density of flaked stone material lay outside of these collection grids. Rather than grid the entire site, this material was collected according to its quadrant provenience. This outlying surface material is indicated in Table 31 by a quadrant extension designation (e.g. NW ext.).

Flaked Stone

The results of the surface collection of flaked stone material are summarized in Table 31. A total of 1401 flaked stone items was recovered from KR-44. Of these 1392 were of obsidian, while the remaining nine items were of a chalcedony material. The highest density of flaked stone occurs in the SE 10 x 10 m grid, where 392 flaked stone items were recovered from a 100 m^2 of surface area. This compares with an average flaked stone density for the entire site of approximately 70 flaked stone items per 100 m^2.

Ground Stone

The only surface ground stone artifact recovered from KR-44 was a pestle found in the northeast quadrant. The pestle, fashioned out of granite measures 24.5 cm in length with an average width of 10.7 cm. As mentioned previously, the pestle was directly associated with a small bedrock mortar.

EXCAVATION

A single 1-m^2 square test unit (N6/E0) as well as the interior area of the rock ring feature were excavated at KR-44. The test unit location was selected according to a subjective evaluation of the greatest surface concentration of midden observable at KR-44. The rock ring feature was divided along a central north-south axis; only the west half of the feature was excavated. The rock ring was excavated as a feature with its western interior perimeter demarcating the excavation sample. Both the test unit and the rock ring feature were excavated in arbitrary 10-cm levels; all deposit was passed through 1/8-inch mesh.

Stratigraphy

There were 3 major depositional layers observed in the 80 cm of deposit excavated at test unit N6/E0. The first 40 cm consisted of a fine grayish-brown soil (Munsell color 10YR 4/1). At about the 40 cm level the deposit began to grade into a more yellowish granular soil (Munsell color 10YR 4/2). This color and texture change became progressively more apparent, until at 80 cm the deposit was almost entirely a coarse decomposing granite (Munsell color 10YR 5/3).

The first 10 cm of the rock ring feature consisted of a grayish gravel (Munsell color 10YR 3/2). At the 10-cm level the deposit quickly assumed a more yellowish color as the excavation approached a base of decomposing granite lying 20 cm below the surface.

SUB-SURFACE FEATURE

Excavation of the rock ring's interior deposit exposed a basin of decomposing granite approximately 20 cm below the original deposit surface. Small amounts of charcoal were contained in the 0-10 cm level. A total of 20 unmodified obsidian flakes and one modified obsidian flake was recovered during excavation of the feature.

SUB-SURFACE ARTIFACTS AND ECOFACTS

Flaked Stone

A total of 290 flaked stone items was recovered during excavation at KR-44. Two hundred eighty-seven of these items were of obsidian, while the remaining three were of chalcedony. Only 3 flaked stone items showed signs of use or modification.

Charred Plant Remains

The following identifiable charred seed parts and core remains were obtained from test unit N6/E0:

N6/E0	10-20 cm	2 pinyon cone scales
	20-30 cm	12 pinyon cone scales, 1 pinyon seed
	40-50 cm	1 pinyon cone scale
	70-80 cm	1 pinyon cone scale

TEMPORAL PLACEMENT

The following source-specific obsidian hydration dates were obtained for test unit N6/E0 and the rock ring feature:

Unit N6/E0

Level	Cat. Number	Hydration Rim (Microns)	Date
0-10	44-119	2.03	A.D. 1163
20-30	44-123	1.61	A.D. 1321
30-40	44-124	4.84	A.D. 146
40-50	44-126	3.63	A.D. 577
50-60	44-130	3.73	A.D. 541
70-80	44-129	3.83	A.D. 505
	Rock Ring Feature		
0-10	44-115	4.54	A.D. 252

As can be seen from unit N6/E0 there is a very general trend for stratigraphic integrity in that absolute age of cultural material increases as one moves down the deposit. Basal dates of A.D. 146 and A.D. 252 (from

the rock ring) would appear to mark the beginning of occupation at KR-44 in the Canebrake Phase with more or less sporadic occupation into the Chimney Phase. No time-sensitive artifacts were recovered from KR-44.

Table 31

KR-44. Distribution and Quantities of Surface Artifacts

	NW 10x10	SW 10x10	NE 10x10	SE 10x10	NW Ext.	SW Ext.	NE Ext	SE Ext.	Total
Chalcedony									
Bifacial Tools	-	1	-	-	-	-	-	-	1
Modified Flakes	1	-	-	-	-	-	-	-	1
Unmodified Flakes	1	-	2	2	2	-	-	-	7
Obsidian									
Bifacial Tools	1	-	-	1	1	1	2	-	6
Modified Flakes	9	13	11	10	10	2	4	9	68
Unmodified Flakes	141	285	148	379	175	19	57	111	1315
Core Shatter	1	-	7	-	1	-	-	3	12
Projectile Points									
Unclassifiable Fragments	-	-	-	-	1	-	-	-	1
Ground Stone									
Pestle	-	-	-	-	-	-	-	-	1

Table 32

KR-44. Distribution of Subsurface Artifacts and Ecofacts

Unit N6/EO and Rock Ring Feature 1

	Unit N6/EO									Rock Ring Feature 1			
	0-10	10-20	20-30	30-40	40-50	50-60	60-70	70-80	Total	Surface	0-10	10-20	Total
Bone Fragments													
Chalcedony													
Unmodified Flakes	1	-	-	-	1	1	-	-	3	-	-	-	-
Obsidian													
Modified Flakes	1	-	-	-	-	-	-	-	1	-	1	-	1
Unmodified Flakes	14	17	25	93	46	32	37	13	277	-	17	3	20

KR-43

KR-43 is located on a small flat area formed by a jutting granitic outcrop that is perpendicular to the main ridge; the site is no more than several hundred meters from KR-44 and KR-60. The site is bounded on both the north and south by ephemeral drainages. Situated at 2243 m (7320 ft) elevation the site area provides a wide view of the valley below. The Pacific Crest Trail follows the main ridge, skirting the western boundary of the site.

The predominant vegetative cover of KR-43 is pinyon, yet there are several stands of oak on and adjacent to, the site. Sage and rabbit brush are also found throughout the site. The nearest permanent water source is more than a kilometer to the southeast.

THE SITE

KR-43 is a diffuse scatter of surface flaked stone occupying an 80 x 45 m area (3600 m^2). The center of the flaked stone scatter is the small flat area adjacent to the granitic outcrop (Map 17). The flaked stone scatter radiates from this center becoming less dense towards the site periphery. Also present in the central area of KR-43 is a dark midden deposit approximately 500 m^2 in surface area. A single rock ring feature was observed in the northwestern area of the site. Although the Pacific Crest Trail runs through the western periphery of KR-43, it does not appear to have seriously disturbed the integrity of the site.

SURFACE FEATURES

A rock ring feature was located in the northwest quadrant (Figure 12). This circular rock ring has an inside diameter of approximately 2 meters and is formed primarily by granite rocks. Subsurface characteristics of the ring are discussed below.

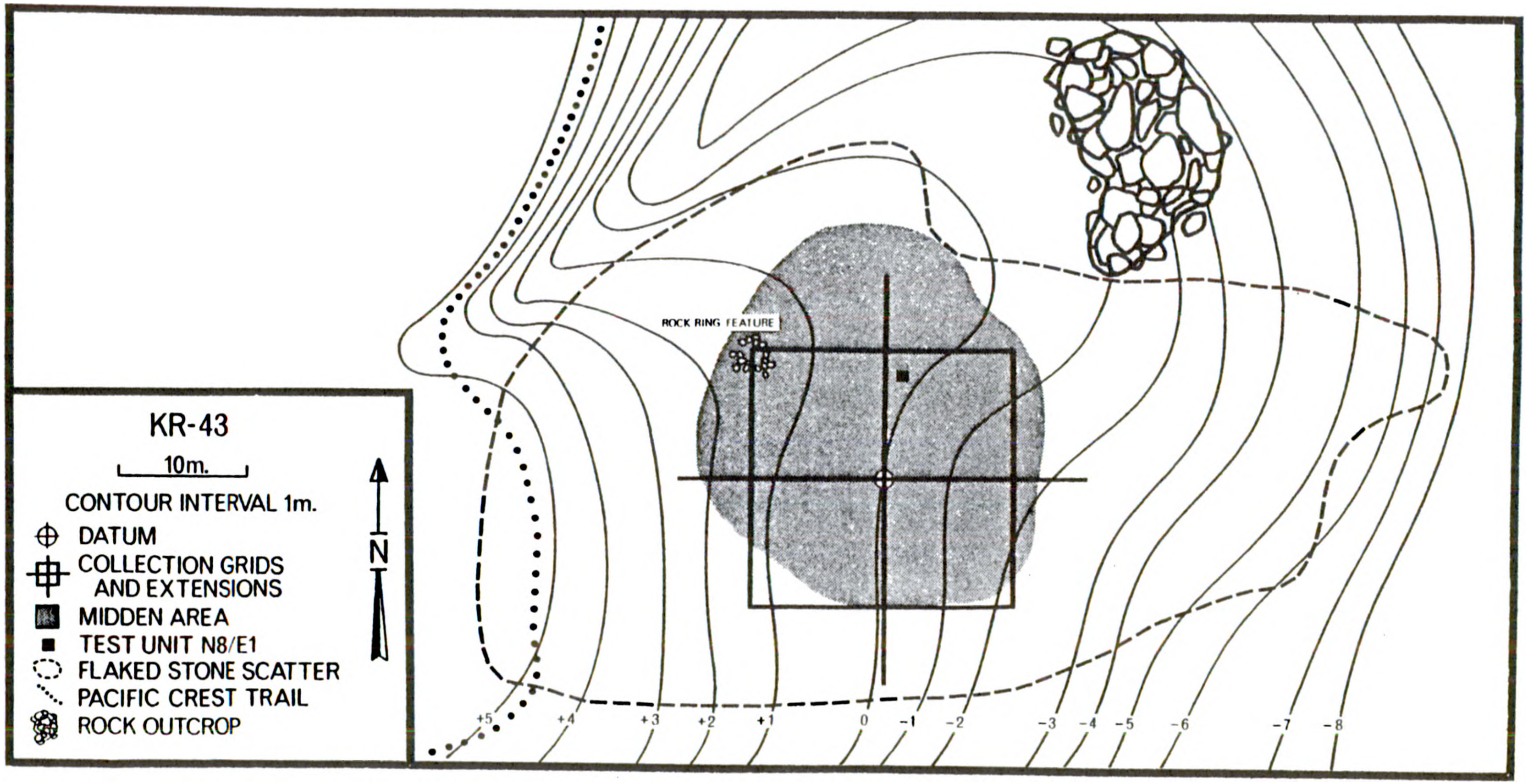
SURFACE COLLECTION

Surface reconnaissance of KR-43 revealed an artifact concentration centered on the location of the datum point. Four 10 x 10 m grids were constructed on a north-south, east-west axis from the datum point. All surface artifacts were then collected from these grids.

A low density of flaked-stone material lay outside the collection grids. This material was collected as an extension of a particular quadrant (e.g., NW ext.). All surface material from KR-43 is presented in Table 33.

Flaked Stone

A total of 304 flaked stone items was recovered from KR-43, of which the vast majority (298) were obsidian. The highest density of flaked stone


ROCK RING FEATURE
+5
+4
+3
+2
+1
0
-1
-2
-3
-4
-5
-6
-7
-8
KR-43
10m.
CONTOUR INTERVAL 1m.
DATUM
COLLECTION GRIDS
AND EXTENSIONS
MIDDEN AREA
TEST UNIT N8/E1
FLAKED STONE SCATTER
PACIFIC CREST TRAIL
ROCK OUTCROP
N

Map 17

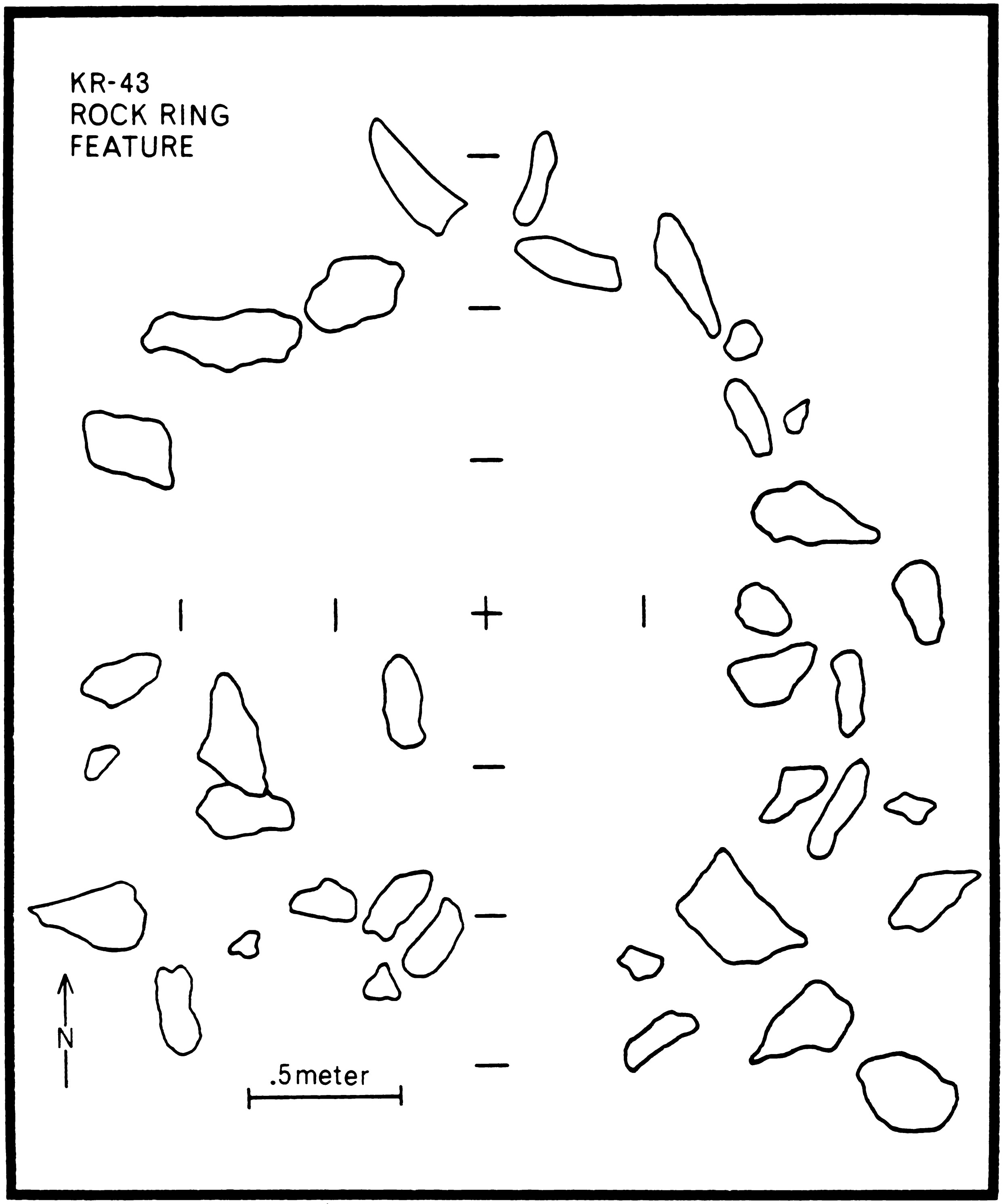


Figure 12

material was recovered in the northeast 10 x 10 m grid, which yielded 87 items within the 100 m^2 surface area. This compares with an average density for the entire site of approximately 11 flake stone items per 100 m^2 of surface area.

Projectile Points

Three projectile points were recovered from the surface of KR-43. Only two of these points were complete enough to be classified: one as a Sierra Concave Base type found in the northeast 10 x 10 grid, and the other as a Desert Side-Notched located in the northwest 10 x 10 m grid.

EXCAVATIONS

A single 1-m^2 test unit (N8/E1) as well as the interior of the rock ring feature were excavated at KR-43. The test unit was centrally located within the midden area. The rock ring feature was divided along a central north-south axis; only the eastern half was excavated. The rock ring was excavated as a feature with its eastern interior perimeter demarcating the excavation sample. Both the test unit and the rock ring feature were excavated in arbitrary 10 cm levels; all deposit was passed through 1/8-inch mesh.

Stratigraphy

Test unit N8/E1 yielded 80 cm of cultural deposit. The first 60-65 cm of deposit was a homogeneous, dark gray-brown midden (Munsell color 10YR 4/2). At the 60-70 cm level there was a sharp grade into a more yellowish, granular deposit. At 80 cm in depth the deposit consisted almost entirely of sterile decomposing granite (Munsell color 10YR 5/2).

The rock ring contained about 15-25 cm of dark brown deposit (Munsell color 10YR 4/2) over a decomposing granite base.

SUBSURFACE FEATURE

Excavation of the rock ring feature exposed a decomposing granitic base 15-25 cm below the surface. No artifactual material was recovered from this deposit. Although the ring was constructed of large granitic rocks, the deposit was littered with quartzite cobble material. This quartzite material occurred in far greater frequencies within the rock ring than other areas of the midden deposit (e.g. test unit N8/E1). Although a modest amount of charcoal was recovered from this feature, none of the quartzite appeared to be fire-affected. It is felt that the presence of these quartzite cobbles is not fortuitous; rather, they may have been used as additional lining or covering for a prehistoric pinyon cache pit.

SUB-SURFACE ARTIFACTS AND ECOFACTS

Flaked Stone

A total of 174 subsurface flaked stone items was recovered from test unit N8/E1. Only 4 specimens exhibited any sign of use modification. Ninety-seven percent of the subsurface assemblage was of obsidian. Table 34 summarizes the distribution of subsurface artifacts and ecofacts recovered at test unit N8/E1.

Charred Plant Remains

The following identifiable charred seed parts and cone remains were obtained from test units N8/E1:

N8/E1	10-20 cm	12 cone scales
	20-30 cm	6 pinyon cone scales and 1 pinyon seed 1 Jeffrey pine cone scale
	30-40 cm	1 pinyon cone scale
	40-50 cm	35 pinyon and digger cone scales, 1 digger seed shell
	60-70 cm	1 pinyon cone axis.

TEMPORAL PLACEMENT

The following source-specific obsidian hydration dates were obtained for test unit N8/E1:

Unit N8/E1

Level	Cat. Number	Hydration Rim (Microns)	Date
0-10	43-064	.75	A.D. 1656
10-20	43-067	2.52	A.D. 981
20-30	43-069	1.81	A.D. 1245
30-40	43-071	3.53	A.D. 631
40-50	43-075	3.43	A.D. 649
50-60	43-076	2.22	A.D. 1092
60-70	43-078	4.04	A.D. 430

As can be seen from the above hydration rim values there is a general trend for stratigraphic integrity in that absolute age of cultural material increases as one moves down the deposit. A basal date of A.D. 430 obtained from the 60-70 cm level would appear to mark the beginning of occupation of KR-43 at the terminal end of Canebrake Phase. Additional hydration dates obtained from test unit N8/E1 indicate a consistent occupation of KR-43 through both the Sawtooth and Chimney Phases as well.

Two time-sensitive projectile points recovered from the surface of KR-43 tend to corroborate the temporal sequence provided by the subsurface obsidian hydration dates. The Sierra Concave Base type projectile point is additional evidence for occupation of KR-43 during the Canebrake Phase while a single Desert Side-Notched type point suggests a late Chimney Phase occupation.

Table 33

KR-43. Distribution of Surface Artifacts

	NW 10x10	SW 10x10	NE 10x10	SE 10x10	NW Ext.	SW Ext.	NE Ext.	SE Ext.	Total
<u>Chalcedony</u>									
Unmodified Flakes	1	1	-	2	-	-	1	-	5
<u>Basalt</u>									
Bifacial Tools	-	-	-	-	-	1	-	-	1
<u>Obsidian</u>									
Bifacial Tools	-	-	-	1	-	1	-	1	3
Modified Flakes	1	3	7	4	3	2	3	2	25
Unmodified Flakes	22	5	79	31	37	4	74	13	265
Core Shatter	-	-	-	1	-	-	2	-	3
<u>Projectile Points</u>									
Desert Side-Notched	1	-	-	-	-	-	-	-	1
Sierra Concave Base	-	-	1	-	-	-	-	-	1
Unclassifiable Fragments	-	-	-	-	-	-	1	-	1

Table 34

KR-43. Distribution of Subsurface Artifacts and Ecofacts

Unit N8/E1

	0-10	10-20	20-30	30-40	40-50	50-60	60-70	70-80	Total
Bone Fragments									
Chalcedony									
Unmodified Flakes	-	-	-	-	1	-	2	-	3
Slate-like Material									
Unmodified Flakes	-	1	-	-	1	-	-	-	2
Obsidian									
Bifacial Tools	1	-	-	-	-	-	-	-	1
Modified Flakes	1	-	-	-	-	-	-	-	1
Unmodified Flakes	32	21	19	15	19	26	29	7	168

Summary and Functional Implications KR-46, -60, -44, and -43

As mentioned previously KR-46, -60, -44, and -43 are all located within 500 m of one another on or near small granitic knolls within a predominantly pinyon woodland. These sites are similar in size (2000-7790 m^2) and possess similar archaeological assemblages. Indeed, KR-46, -60, -44, and -43 are inferred to be indicative of a particular prehistoric subsistence-settlement type: the temporary pinyon station.

A number of data sets are available to support this designation, not the least of which is the presence of a quantity of vegetal processing equipment at KR-44, -46, -60. Essential to the pinyon processing are such grinding and crushing tools as bedrock and portable metates, mortars, pestles, etc. While each of these sites contained varying quantities and different generic classes of ground stone, the inferred importance of vegetal food (of which pinyon, undoubtedly, was a major constituent) seems beyond dispute. Further direct evidence of pinyon exploitation is evident in the recovery of charred pinyon seed and cone remains in both test units and rock ring features at these sites.

Pinyon nuts were also cached in natural rock "shelters" or rock lined pits within the pinyon areas of the Tübatulabal (Voegelin 1938). Not surprisingly, KR-43, -44, and -60 exhibited rock ring features that may be the remains of prehistoric pinyon caches. Without exception, these rock ring features were located toward the peripheries of these sites and were constructed over a bedrock granite substrate. In addition, these rings contain little in the way of artifactual material that would be consistent with their use as habitation structures. The one exception to this pattern was observed at rock ring feature 2 at KR-60. One hundred thirty-three flaked stone items were recovered from the interior of this feature. In addition, a bedrock metate was located on the ring's perimeter. It may be that this feature served as a temporary habitation structure. In this light, Voegelin (1938) mentions that when collecting pinyon, single families would sometimes build temporary brush structures at higher elevations. Either as caches or temporary structures, rock ring features remain a diagnostic attribute of temporary pinyon stations.

Another characteristic of temporary pinyon stations is the presence of a significant subsurface midden deposit which contain a relatively light density of artifactual material. A major facet of the pinyon harvest involves the roasting of cones or beds of sage (Voegelin 1938). Undoubtedly, the midden deposits at KR-46, -60, -44 and -43, containing substantial quantities of charcoal but little else, were more the result of this roasting process rather than other habitation activities.

The relative low density of flaked stone material indicates that tool manufacture was of minor importance during the height of the pinyon harvest when these temporary pinyon stations were occupied. Ethnographic information (Voegelin 1938) indicates that men, women, as well as children participated in a singular and hurried effort to harvest pinyon during late September and early October. Flaked stone tools, when manufactured at these pinyon stations, were probably for immediate use. This may explain why a high percentage of flakes found at these temporary pinyon stations exhibit signs of utilization.

The presence of projectile points and other flaked stone tools at

these sites suggests that hunting was occurring in the context of temporary pinyon stations. Yet, the almost total lack of faunal material within these substantial midden deposits would seem to indicate that hunting activity was at a low level during the pinyon harvest. An alternative, but not mutually exclusive hypothesis, is that large animal kills may have been transported back to pinyon base camps (such as KR-39 and 41) for distribution among several families. (See Faunal Analysis section for a further discussion of this point.)

As demonstrated by chronometric data from KR-43, -44, -46, and -60, temporary pinyon stations appear to be of long standing as a subsistence-settlement type. Source-specific obsidian hydration dates from all four sites suggest that their occupation commenced at from A.D. 1 to A.D. 400, or during the Canebrake Phase. In addition, a Sierra Concave Base projectile point (temporal range: 1200 B.C. to A.D. 600) was recovered from KR-43.

KR-50

KR-50 is situated upon a small spur perpendicular to a precipitous ridge line. The spur provides one of the few small, flat areas found along the northeastern face of the ridge. KR-50 situated at 2412 m (7920 ft) also provides a wide view of the drainage located some 100 m below. An intermittent stream and several spring areas were observed in this drainage.

The vegetation at KR-50 is predominantly pinyon, with a few isolated juniper trees. Additional vegetation includes rabbit brush and sage brush.

THE SITE

KR-50 is a diffuse flaked stone scatter approximately 500 m^2 in surface area (Map 18). Most of this flaked stone material consisted of obsidian, although a projectile point and a bifacial scraping tool, both manufactured from a fine grained basalt, were also observed. In addition a small midden area (200 m^2) centrally located on the spur's flat area was also observed. No other surface features were noted. The Pacific Crest Trail is located approximately 10 m west of the flaked stone scatter's western perimeter.

SURFACE COLLECTION

Surface reconnaissance of KR-50 revealed a flaked stone concentration within the flat area of the spur. Four 10 x 10 m collection grids were constructed along a north-south, east-west axis from a datum point established within the observed center of the flaked stone scatter. All surface artifacts were collected from these grids.

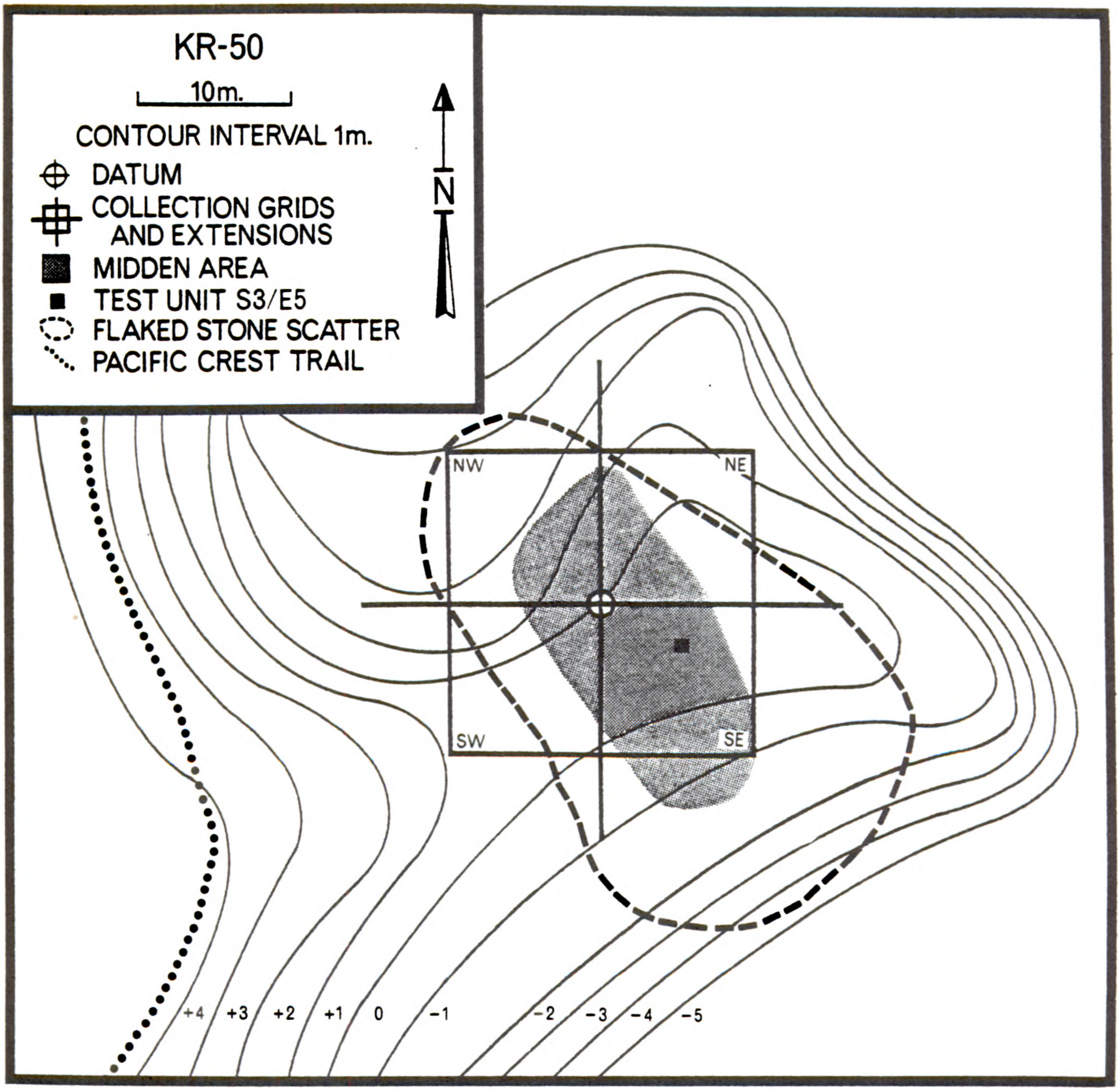
A low density of flaked stone material lay outside of the collection grids. This material was collected as an extension of a particular quadrant (e.g. NW ext.). Data for all surface material from KR-50 is presented in Table 35.

Flaked Stone

A total of 106 flaked stone items was recovered from the surface of KR-50. These included a number of unmodified obsidian flakes, core fragments, utilized flakes, and bifacial tools. All but two items of this flaked stone assemblage were of obsidian; the remainder consisted of two basalt tools (Fig. 13). One of these tools was a lanceolate scraping tool 6.0 cm in length and 3.2 cm in width, with a maximum thickness of 1.0 cm. The other basalt tool was a Pinto projectile point found in the southeast 10 x 10 m collection grid.

EXCAVATION

Original Government surveys did not indicate the presence of midden


KR-50
10m.
CONTOUR INTERVAL 1m.
DATUM
COLLECTION GRIDS AND EXTENSIONS
MIDDEN AREA
TEST UNIT S3/E5
FLAKED STONE SCATTER
PACIFIC CREST TRAIL
N
NW
NE
SW
SE
+4
+3
+2
+1
0
−1
−2
−3
−4
−5

Map 18

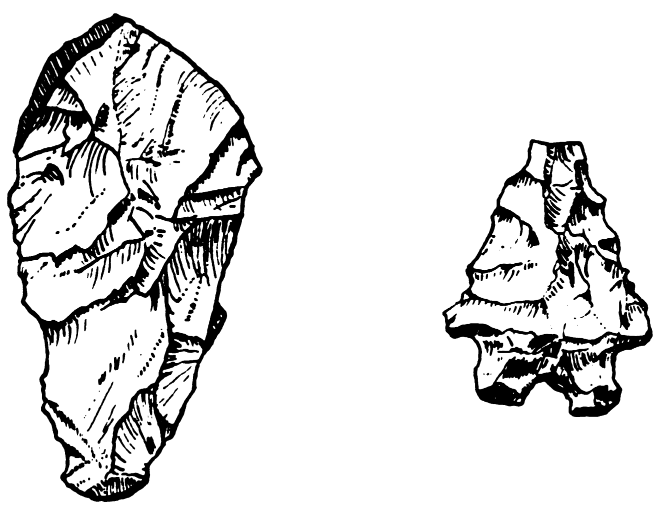


Fig. 13. Basalt scraper and Pinto projectile point.
(Scale: actual size)

deposits at KR-50 (Montizambert 1978). Upon discovery of a small area of soil discoloration the Government approved the excavation of a single one-meter square test unit. The test unit, S3/E5, was centrally located within this discolored area. The unit was then excavated in arbitrary 10 cm levels; all deposit was screened through 1/8-inch mesh.

Stratigraphy

Test unit S3/E5 exhibited only 15-20 cm of homogenous grey-brown midden (Munsell color 10YR 3/2) intermixed with gravels before terminating on a bedrock substrate.

Flaked Stone

Only 31 flaked stone artifacts were recovered from Test Unit S3/E5. These were predominantly unmodified obsidian flakes. The distribution and quantities of subsurface artifacts are presented in Table 36.

Plant Macrofossils

An analysis of charred plant macrofossils from test unit S3/E5 resulted in the following identifications:

S3/E5	0-10 cm	25 pinyon cone scales, 3 pinyon seed shells
	10-20 cm	23 pinyon cone scales, 2 pinyon seeds.

TEMPORAL PLACEMENT

Pinto projectile points are the primary diagnostic indicator of the Lamont Phase (4000 B.C. - 1200 B.C.). The recovery of such a point form from the surface of KR-50 suggests that this site has the earlier component of any site located along the Bear Mountain Segment. The large, basalt scraping tool collected at KR-50 further corroborates the antiquity of the site. The use of basalt in stone tool manufacture was generally more prevalent during earlier occupation periods throughout the trans-Sierran area.

Only one source-specific obsidian hydration date was obtained from subsurface deposits at KR-50: A.D. 1139. While certainly tentative, this date would indicate that KR-50 may have been sporadically visited during more recent phases as well.

SUMMARY AND FUNCTIONAL IMPLICATIONS

Most notable in the archaeological assemblage of KR-50 is the lack of bedrock and portable milling equipment. This characteristic, coupled with the fact that the flaked stone assemblage contains a relatively high percentage of formalized tools and modified flakes in comparison to unmodified flakes, suggests that KR-50 primarily functioned as a temporary

hunting camp. The site's high, ridge face location is well suited as a hunting lookout. Yet even this hunting activity was, undoubtedly, exceedingly sporadic as suggested by the paucity of flaked stone artifacts recovered.

Paradoxically, a significant quantity of charred pinyon cone scales and seeds was recovered from test unit S3/E5. The absence of any vegetal processing tools would seem to indicate that pinyon pine was not systematically exploited but simply was collected on or near the site for immediate consumption by hunting parties that camped at KR-50.

There is very little evidence that a systematic exploitation of pinyon resources occurred prior to 1000 B.C. in the southern Sierra Nevada (McGuire and Garfinkel 1979). Indeed, it was suggested in the Research Objective section of this report that any evidence of occupation of the Bear Mountain Segment prior to 1200 B.C. would most likely be the result of isolated hunting activity in upland areas. The recovery of artifacts diagnostic of the Lamont Phase (4000 B.C. - 1200 B.C.) in the functional context of hunting activity at KR-50 tends to support this one aspect of the model of prehistoric land use in the southern Sierra Nevada.

Table 35

KR-50. Distribution and Quantities of Surface Artifacts

	NW 10x10	SW 10x10	NE 10x10	SE 10x10	NW Ext.	SW Ext.	NE Ext.	SE Ext.	Total
Basalt									
Bifacial Tools	-	1	-	-	-	-	-	-	1
Obsidian									
Bifacial Tools	1	-	1	-	-	-	-	-	2
Modified Flakes	2	3	3	10	3	-	-	7	28
Unmodified Flakes	21	10	9	17	6	-	-	9	72
Core Fragments	2	-	-	-	-	-	-	-	2
Projectile Points									
Pinto	-	-	-	1	-	-	-	-	1

Table 36

KR-50. Distribution and Quantities of Subsurface Artifacts

Unit S3/E5

	0-10	10-20	Total
Chalcedony			
Unmodified Flakes	1	-	1
Obsidian			
Modified Flakes	1	-	1
Unmodified Flakes	26	3	29

KR-49

KR-49 is located on a ridge line saddle approximately 235 m southwest of the Long Valley Loop Road. At an elevation of 2426 m (7960 ft) KR-49 is the highest site located along the Bear Mountain Segment and as such provides a wide vista toward Chimney Meadows to the east and Rock House Basin to the west.

The saddle upon which KR-49 is located is relatively broad and flat, with a vegetation cover predominately of pinyon on the northern half of the site and an open sage brush meadow in the southern area (Plate 10). No available water sources were observed in the immediate vicinity of the site although several springs were noted along the Long Valley Loop Road toward the northeast.

THE SITE

KR-49 is a broad obsidian flaked stone scatter approximately 55 m in length and 40 m in width (2000 m^2) (Map 19). No surface features, portable milling equipment or midden deposits were observed. Interestingly, several large piles of pinyon pine cones were seen on the surface of KR-49. Many of the pinyon areas located in the Bear Mountain Segment vicinity are preferred collection areas for individuals as well as commercial harvesters. These pine cone heaps are thought to be manifestations of this modern collection activity.

The Pacific Crest Trail bisects the southern area of KR-49 at the ecotone of the sagebrush meadow and pinyon pine forest. No other disturbances were noted at KR-49, although recent activity relating to trail construction and pinyon collection coupled with an extreme dearth of formalized tools suggest this site may have been surface collected by amateur collectors.

SURFACE COLLECTION

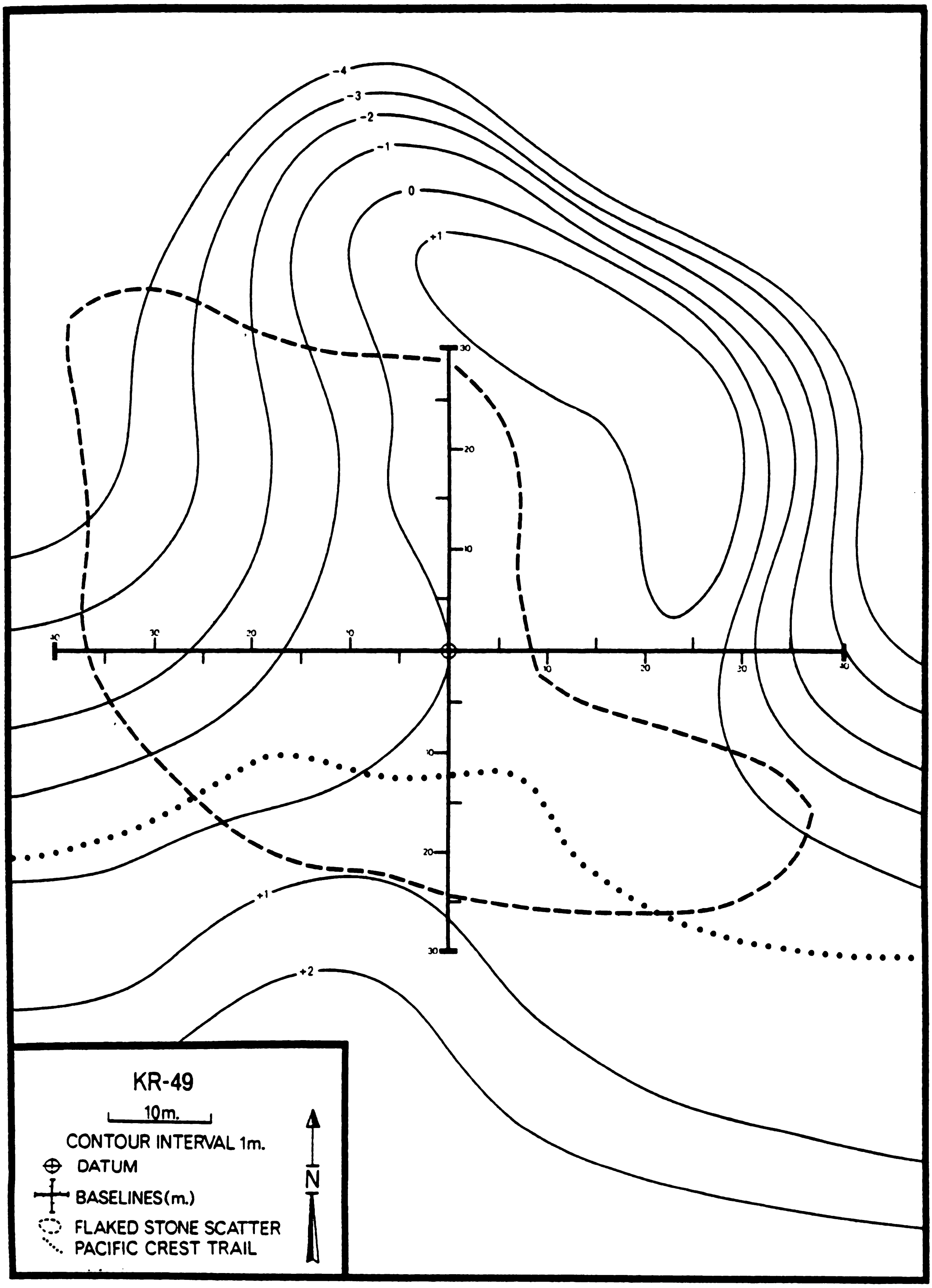
Due to the relatively large surface area and flaked stone density at KR-49 a 25% surface collection was undertaken. A north-south base line, bisecting the site, was laid out from a centrally located datum point. Five randomly selected transects, oriented in an east-west direction, were collected. Each 2 m wide transect was divided into a series of 5-m sections which were collected as separate analytical unit. A total of 480 m^2 of site surface area was collected in this fashion.

In addition, the entire site was surveyed for the purposes of collecting any time sensitive artifacts and portable milling equipment both of which are particularly susceptible to unauthorized collection. No artifacts of this nature were discovered.

Flaked Stone

A total of 1400 flaked stone items was recovered from the 25% surface collection of KR-49 (Table 38). This represents an average flaked

Plate 10. Open sagebrush meadow in the southern area of KR-49. The Pacific Crest Trail runs along the forest edge.


KR-49
10m.
CONTOUR INTERVAL 1m.
DATUM
BASELINES(m.)
FLAKED STONE SCATTER
PACIFIC CREST TRAIL
N
-4
-3
-2
-1
0
+1
+2

Map 19

stone density of 291/100 m^2. Of course, much of this material occurs in discrete concentrations within the site. Map 20 is a computer assisted flaked stone density map which indicates major concentrations of flaked stone within KR-49.

Of interest is the almost total lack of bifacial tools at KR-49. As already indicated, this may be the result of surface collecting by relic hunters, rather than a reflection of prehistoric cultural activities.

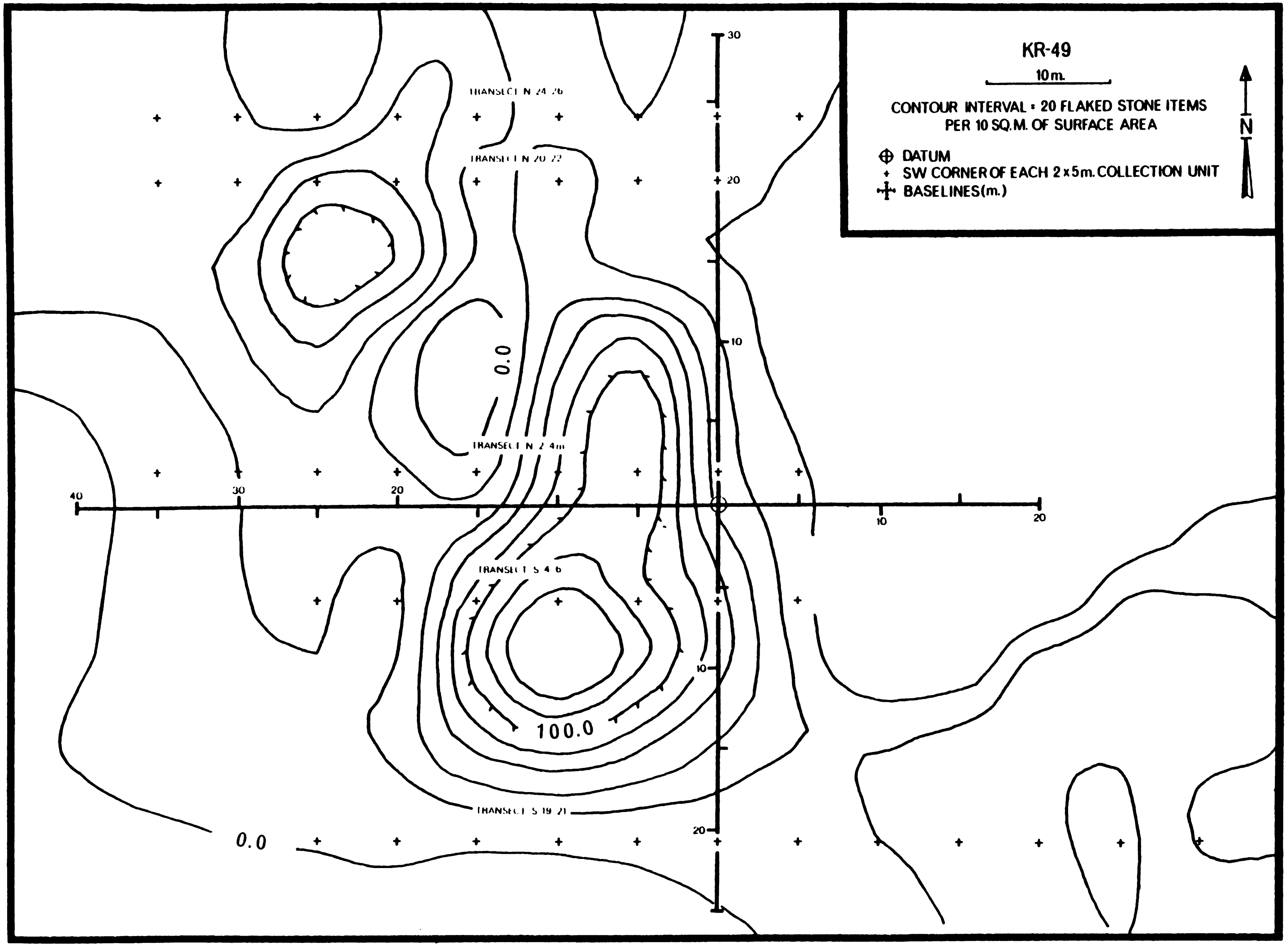
TEMPORAL PLACEMENT

No time sensitive artifacts or subsurface samples of obsidian suitable for dating were obtained from KR-49.

FUNCTIONAL IMPLICATIONS AND SUMMARY

KR-49, although situated in a pinyon woodland, is devoid of the vegetal processing equipment and/or rock rings which are generally diagnostic of the temporary pinyon stations that occur throughout the southern Sierra Nevada.

KR-49 does possess a relatively high density of obsidian flaked stone consisting of numerous modified and unmodified flakes. This would indicate an elaboration of activities related to hunting. The site's ridgeline saddle location would have provided an excellent vantage point for the spotting or ambush of large mammals, especially deer.



Map 20. Surface flaked stone density at KR-49

Table 37

KR-49. Surface Distribution of Artifacts by Transect

	N 2-4 m	N 20-22 m	N 24-26 m	S 4-6 m	S 19-21 m	Total
Chalcedony						
Unmodified Flakes	-	-	-	1	-	1
Obsidian						
Bifacial Tools	-	-	-	1	-	1
Modified Flakes	17	7	15	22	6	67
Unmodified Flakes	309	230	168	440	174	1321
Core Fragments	2	2	2	4	-	10

KR-53

Although KR-53 is situated at an elevation of 2377 m (7800 ft), the terrain in the immediate vicinity of the site is characterized by gently rolling bluffs and shallow meadow areas. KR-53 is located on a broad north-east facing bluff overlooking a shallow swale (Map 21). The bluff slopes gently toward the swale at the bottom of which an intermittent stream drainage was observed.

The upper elevations of this small bluff on which KR-53 is located are dominated by pinyon pine, while the lower areas nearest the swale open out to a broad sagebrush meadow.

THE SITE

KR-53 is a moderate sized flaked stone scatter measuring approximately 50 x 60 m (3000 m^2). No surface features, portable milling equipment, or midden were observed.

The Pacific Crest Trail has been constructed through the center of KR-53, disrupting the integrity of the flaked stone scatter. As the trail is only 1 meter wide, disturbance from this source appears to be minimal. In addition, a jeep trail and informal camping area were observed 100 m southwest of the KR-53, possibly resulting in indirect impacts to the site.

SURFACE COLLECTION

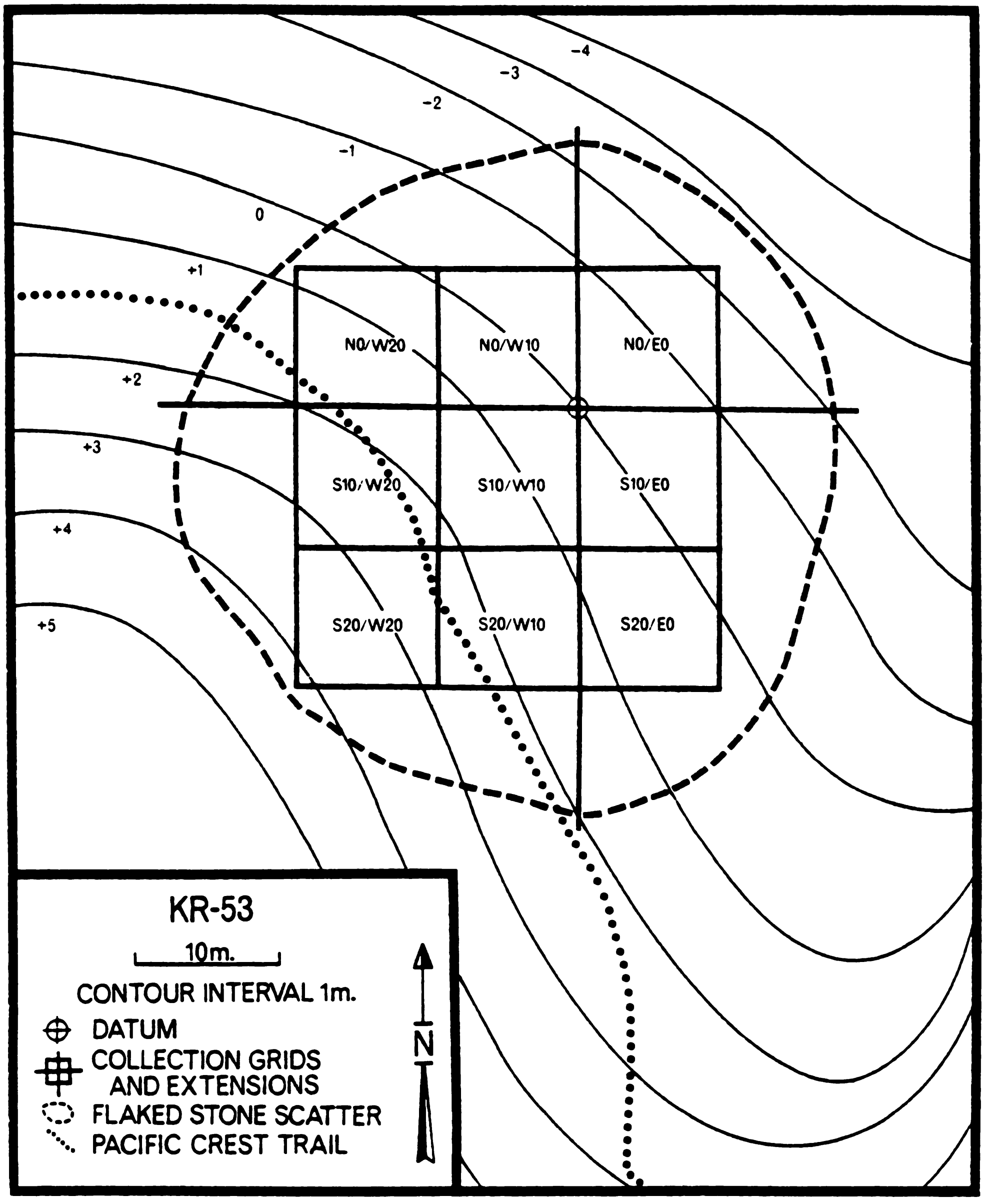
Due to the moderate surface area of KR-53, as well as the relatively low density of flaked stone material, a 100% surface collection of the site was undertaken. A north-south and east-west base line were laid out from a centrally located datum point. A series of 9 10 x 10 m collection grids were constructed along the base lines. A small amount of artifactual material lay outside of the area encompassed by the collection grids; this material was collected according to its quadrant provenience (and is designated as a quadrant extension, e.g. NW Ext., in Table 38). Frequencies and distributions of all surface artifacts are given in Table 38.

Flaked Stone

A total of 655 flaked stone items was recovered from KR-53. This represents an approximate flaked stone density of 22/100 m^2 of surface area. This assemblage includes a number of unmodified and modified obsidian flakes, as well as several bifacial tools and a core fragment. In addition, a single unmodified chalcedony flake as well as a single basalt core fragment were recovered from KR-53.

Projectile Points

One Eastgate Expanding Stem projectile point fashioned from obsidian was recovered from Northwest quadrant extention.



-4
-3
-2
-1
0
+1
+2
+3
+4
+5
N0/W20
N0/W10
N0/E0
S10/W20
S10/W10
S10/E0
S20/W20
S20/W10
S20/E0
KR-53
10m.
CONTOUR INTERVAL 1m.
DATUM
COLLECTION GRIDS AND EXTENSIONS
FLAKED STONE SCATTER
PACIFIC CREST TRAIL
N

Map 21

TEMPORAL PLACEMENT

The only artifact recovered at KR-53 possessing diagnostic temporal significance is the Eastgate Expanding Stem projectile point. This projectile point with a suggested time range of A.D. 600-1300 is considered representative of the Sawtooth Phase in the southern Sierra Nevada.

SUMMARY AND FUNCTIONAL IMPLICATIONS

A high ratio of modified flakes to unmodified flakes as well as the recovery of an Eastgate series projectile point suggest a strong emphasis on activities related to hunting. Undoubtedly, obsidian flakes were being detached from cores for immediate use in the preparation of animal products. While hunting activity is represented at a number of other sites along the Bear Mountain Segment, KR-53 and other temporary hunting camps are unique in that this appears to be the only functional activity manifest at these sites. Vegetal processing and storage equipment, including portable and bedrock milling tools and rock-ring features, are completely absent. Also missing is the midden development characteristic of habitation activities and pinyon roasting.

Table 38

KR-53. Frequency and Distribution of Surface Artifacts

	N0 W10	N0 W20	N0 E0	S10 W10	S10 W20	S10 E0	S20 W10	S20 W20	S20 E0	NW Ext.	SW Ext.	NE Ext.	SE Ext.	Total
Chalcedony														
Unmodified Flakes	-	-	-	-	-	-	-	-	-	-	1	-	-	1
Basalt														
Core Fragments	-	-	-	-	-	-	-	-	-	-	1	-	-	1
Obsidian														
Bifacial Tools	-	-	-	-	-	-	-	1	1	-	-	-	-	2
Modified Flakes	8	4	5	1	-	12	-	3	1	10	15	8	-	67
Unmodified Flakes	60	22	74	84	20	94	13	7	31	39	89	21	29	583
Core Fragments	-	-	-	-	-	-	-	-	-	-	-	1	-	1
Projectile Points														
Eastgate Expanding Stem	-	-	-	-	-	-	-	-	-	1	-	-	-	1

KR-57

KR-57, located at an elevation of 2065 m (7200 ft), is situated along a relatively level east-west trending ridge line. Both the northern and southern perimeters of the site exhibit pronounced slopes that drop precipitously toward lower drainage areas. Perched as it is atop a prominent ridge, KR-57 commands a wide view that overlooks Rock House Basin and the South Fork of the Kern River which are several kilometers to the east.

The predominant vegetation of KR-57, as well as the surrounding areas, is pinyon pine. Other vegetation observed at KR-57 includes: juniper, sagebrush, mountain mahogany, buck brush, and beavertail cactus.

A perennial unnamed spring is located 500 m north of the site. In addition intermittent streams are located directly below the site to the north as well as south.

THE SITE

KR-57 is a large, linear flaked stone scatter spanning 250 m along the ridge and covering approximately 13,000 m^2 of surface area (Map 22). In addition the site contains two small midden areas as well as two large bedrock milling complexes (Map 22). The larger of the midden areas covers approximately 600 m^2 and is located adjacent to Bedrock Milling Complex 1. The other midden is approximately 300 m^2 in surface area and is situated atop a small knoll that rises above the main ridge line (Map 22).

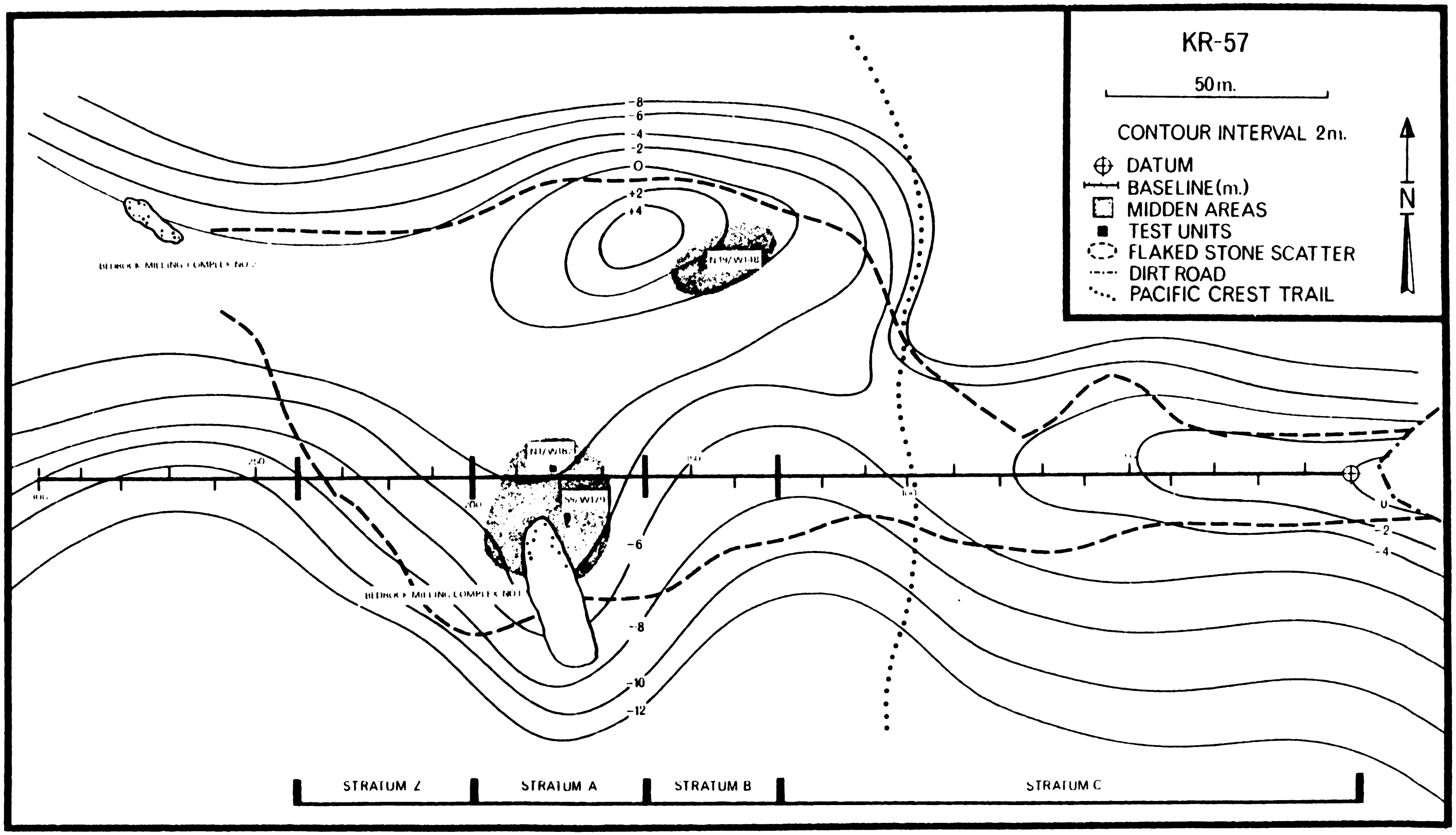
There are a number of serious disturbances at KR-57. A jeep trail cuts through the eastern edge of the site. This same area has been bulldozed and exhibits signs of recent occupation - i.e. modern hearths and debris. A mining claim cairn and 3 assessment pits were observed at the western end of KR-57. The Pacific Crest Trail runs through the center of the site.

SURFACE FEATURES

Two major bedrock milling complexes, each consisting of both mortars and grinding slicks, were recorded. The first, Bedrock Milling Complex 1, is composed of six mortars and four slicks along a sedimentary outcrop near the south central margin of KR-57 (Map 22). The larger midden is associated with this complex. The mortars range in diameter from 4.0 to 10.4 cm and are between 0.8 and 4.9 cm in depth. The grinding slicks are ovoid in shape ranging in size from 21 x 12 cm to 55 x 21 cm.

The second complex, Bedrock Milling Complex 2, is located atop a large sedimentary rock outcrop at the western edge of the site. Here there are 5 mortars ranging in diameter from 5.5 to 10.5 cm and between 1.0 to 5.4 cm in depth. One mortar measuring 10.5 cm in diameter and 2 cm in depth exhibited a pecked rather than ground surface. A total of eight grinding slicks were also recorded at Bedrock Milling Complex 2. Three of the mortars are immediately adjacent to slicks. These slicks were ovoid in shape ranging in size from 19 x 16 cm to 58 x 50 cm.

Map 22


KR-57
50 m.
CONTOUR INTERVAL 2m.
DATUM
BASELINE (m.)
MIDDEN AREAS
TEST UNITS
FLAKED STONE SCATTER
DIRT ROAD
PACIFIC CREST TRAIL
N
-8
-6
-4
-2
0
+2
+4
-6
-8
-10
-12
-2
-4
STRATUM Z
STRATUM A
STRATUM B
STRATUM C

SURFACE COLLECTION

As mentioned previously, the flaked stone scatter at KR-57 covers approximately 31,000 m^2. To insure a representative surface collection sample of such an extensive area the site was divided into four sampling strata (i.e Stratum A, B, C, and Z). These strata were selected in an effort to provide representative coverage of suspected activity areas (e.g. midden and milling areas contained in strata A and B), as well as outlying areas containing lower densities of cultural material (e.g. strata C and Z). Randomly selected north-south transects representing a ten percent sample of each stratum were then collected. Each transect was divided into a series of 2 x 5 m collection units with each unit being 100 percent collected.

In addition all time-sensitive artifacts and portable milling equipment encountered outside of the collection transects were collected according to stratum provenience.

Flaked Stone

As can be seen on Table 40, over 5000 flaked stone items were recovered from the 10 percent surface collection of KR-57. This assemblage consisted primarily of debitage although modified flakes, bifacial tools, core fragments, and projectile points were also recovered. The average flaked stone density for the entire surface sample was 43 flaked stone items/100 m^2 of surface area. Of course, flaked stone material is not distributed evenly throughout the site but occurs in discrete concentrations. Map 23 is a computer assisted flaked stone density map that illustrates major flaked stone concentrations.

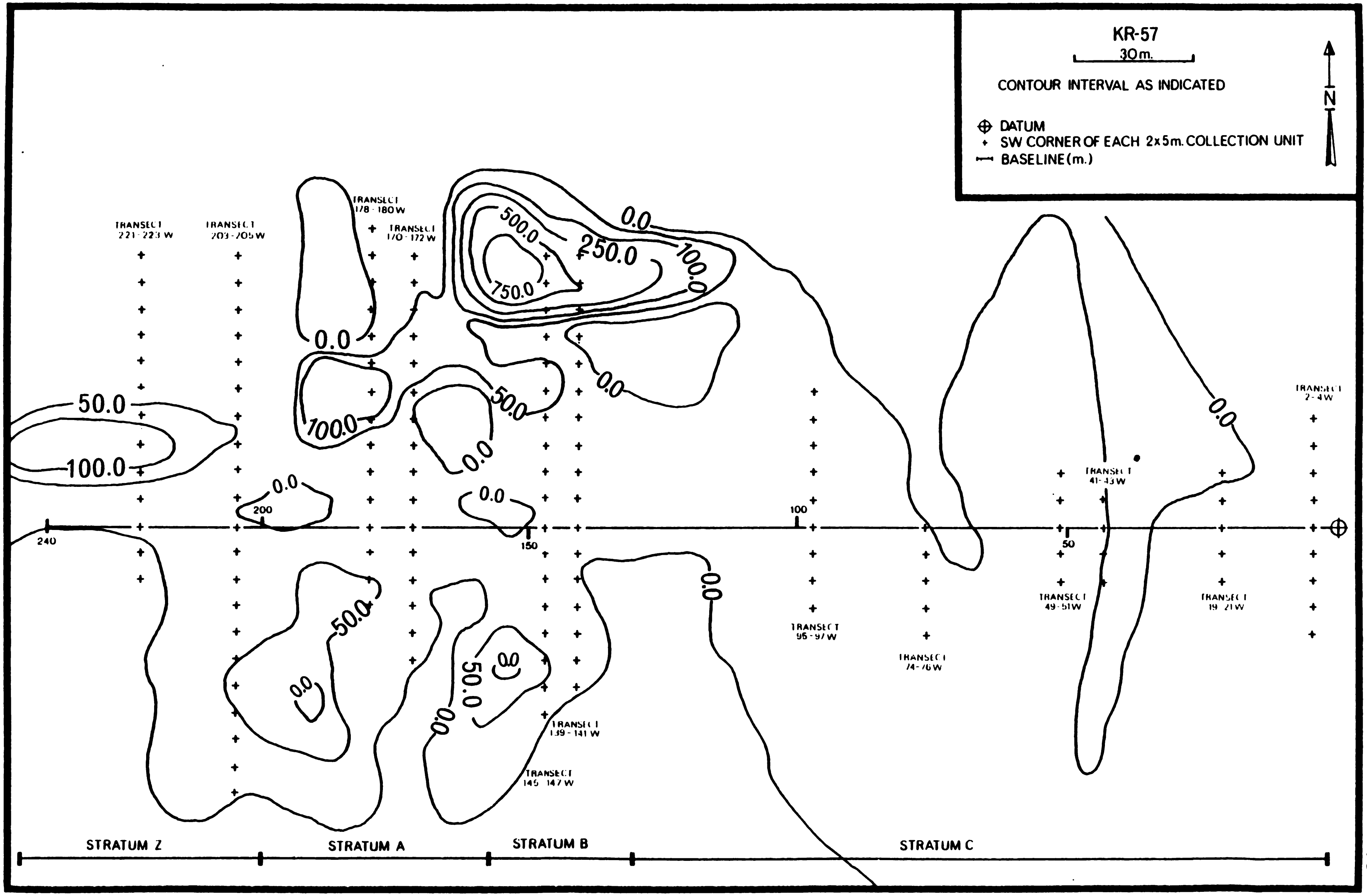
As can be seen from this map, major flaked stone concentrations are confined to the northern areas of stratums B and C. The extreme densities encountered in Stratum B correspond to the location of the midden area also present in this stratum. Smaller flaked stone concentrations were observed in the southwestern area of KR-57 in the vicinity of the larger midden area and Bedrock Milling Complex 1.

Projectile Points

A total of six projectile points were collected at KR-57. Five are made of obsidian, one is of chalcedony. Four of the obsidian specimens were identifiable as to type. Two of these were Cottonwood Triangular forms. The first was recovered from transect 178-180W in Stratum A and is complete. The second, from transect 49-51W in Stratum C, consisted of a basal fragment. The remaining two points were recovered from outside of the collection transects in Stratum Z. One was an incomplete Elko-Eared form and the other consisted of a basal fragment from a Sierra Concave Base.

Ground Stone

Three ground stone artifacts were recovered from KR-57: one mano



Map 23. Surface flaked stone density at KR-57

and two metates. The mano, recovered from transect 170-172W in Stratum A was a waterworn granitic cobble measuring 9 x 8.5 x 5.5 cm. The remaining two metates were recovered from outside the collection transects in Stratum Z. The first constructed from serpentine and unifacially ground measured 36 x 31 x 6.5 cm. The second was bifacially worked measuring 45 x 16 x 5 cm. In addition, a small pecked depression some five centimeters wide and 1.3 cm deep was observed on the smaller of the two grinding surfaces of this metate.

Pendant

A fragment of a bifacially drilled serpentine pendant was recovered from collection transect 170-172W, Stratum A. The perforation is not complete as the stone fractured probably during manufacture through the drilled area.

EXCAVATION

Two midden areas were observed at KR-57, one of which was located in Stratum A adjacent to Bedrock Milling Complex 1 and the other in Stratum B associated with a high density of flaked stone material (Map 23). While the former exhibited a markedly different color and consistency from the surrounding soil, the latter showed only slight differentiation in this respect. Two 1 x 1 m test units (N1/W182 and S9/W179) were excavated in the midden area located in Stratum A. A single 1 x 1 m test unit (N49/W148) was excavated in the midden area located in Stratum B. All excavation units were excavated in arbitrary ten centimeter levels with all deposits being screened through one-eighth inch mesh.

Stratigraphy

Test unit S9/W179 possessed a fine-grained, dark grey deposit (Munsell 10YR 3/2) interspersed with moderate amounts of charcoal and decomposing sedimentary inclusions. Bedrock was encountered at 20 cm. In contrast, the consistency of the deposit at test unit N1/W182 was coarser and the soil a somewhat lighter grey-brown (Munsell 10YR 4/2). Small amounts of charcoal were present although no concentrations were observed. This unit hit bedrock at 15 cm. The physical differences evident between these two units seems to be a function of their respective locations within the midden area - i.e. test unit S9/W179 with its darker fine grained deposit is adjacent to Bedrock Milling Complex 1 whereas test unit N1/W182 with its lighter and coarser deposit is more than 10 m to the north, near the midden's periphery.

The deposit at test unit N49/W148 was a light grey-brown in color (Munsell 10YR 5/3). Very little charcoal was present. This unit proved to be the shallowest of the three with over half the unit terminating at bedrock at 10 cm and the remainder at 15 cm.

Flaked Stone

The entire subsurface assemblage at KR-57 is summarized on Table 41. Again, obsidian is the preferred material for flaked stone tool manufacture comprising over 99% of the subsurface assemblage. Of interest is the extreme density of flaked stone items encountered in the shallow deposit at test unit N49/W148. These subsurface data coupled with the extreme density of flaked stone material observed on the surface from this vicinity (Map 23) suggest that this area of KR-57 may have habitually served as a flaked stone tool manufacturing area.

TEMPORAL PLACEMENT

The following source-specific obsidian hydration dates were obtained from the subsurface deposits at KR-57:

Provenience		Catalog Number	Hydration Rim (microns)	Date
59/W179	0-10 cm	57-427	2.72	879 A.D.
59/W179	0-10 cm	57-428	3.13	729 A.D.
59/W179	0-10 cm	57-429	3.63	549 A.D.
59/W179	0-10 cm	57-441	3.73	513 A.D.
N1/W182	0-10 cm	57-452	3.03	766 A.D.
N49/W182	0-10 cm	57-457	3.23	693 A.D.
N49/W182	10-20 cm	57-473	2.32	1072 A.D.

While the sample size is small, all source-specific obsidian hydration dates cluster in the Sawtooth Phase (A.D. 600 - A.D. 1300). Earlier occupation during the Canebrake Phase (1200 B.C. - A.D. 600) is indicated by the recovery of an Elko Eared and Sierra Concave Base projectile points. Interestingly both of these projectile points were recovered from the site periphery in Stratum Z suggesting the possibility of intra-site horizontal differences in temporal components. Late occupation during the Chimney Phase (A.D. 1300 - A.D. 1850) at KR-57 is demonstrated by the recovery of two Cottonwood Triangular projectile points.

SUMMARY AND FUNCTIONAL IMPLICATIONS

The surface constituents and large size of KR-57 are most directly comparable to KR-41 and KR-39 which were inferred to have functioned as pinyon base camps. In all three cases there appears to be an emphasis on vegetal processing activities as suggested by the quantity of portable and bedrock milling equipment. Such a quantity and diversity of milling equipment indicate a relatively stable habitation of these sites as well.

KR-57 is also characterized by a large quantity and diversity of modified flakes (e.g. damage intensities and edge angles) and by a vast amount of flaked stone debitage which encompasses a variety of sizes. These data suggest a wide range of tool manufacturing procedures (e.g. primary and secondary reduction, retouch) as well as uses (e.g. cutting, scraping, etc.). As with KR-39 and KR-41, the above flaked stone data would imply an elaboration of subsistence activities and greater habitational intensity (see Analysis of Flaked Stone).

While the site contains two separate midden areas, these deposits lack the rich artifactual and ecofactual inventory as well as the degree of depth recorded at KR-41 and KR-39 Whether this lack of depth is the result of prehistoric aboriginal behavior or natural erosional processes acting upon a ridgeline site location is unclear. It may simply be that the 250 m of flat ridge area at KR-57 provided a number of potential camping spots, thus preventing the accumulation of a large amount of midden in any one area. With the above limitations in mind, KR-57 appears to be best tentatively classified as a pinyon base camp.

Table 40
KR-57. Distribution and Frequencies of Artifacts from Surface Transects

	Stratum C						Stratum B		Stratum A		Stratum Z		
	2-4W	19-21W	41-43W	49-51W	74-76W	95-97W	139-141W	145-147W	170-172W	178-180W	203-205W	221-223W	Total
Chalcedony													
Modified flakes				1									1
Unmodified flakes		2		3		1	5	1	1	1	8	27	49
Core shatter											2	4	6
Projectile Points													
Fragments				1									1
Obsidian													
Bifacial tools				1		1		4			3	2	11
Modified flakes	3	7		1	1	5	28	34	24	16	20	22	161
Unmodified flakes	45	60	2	23	8	55	1120	2006	397	501	531	472	5220
Core shatter							2	2	1	2	1	2	10
Projectile Points													
Cottonwood triangular				1						1			2
Fragments				1			1						2
Groundstone													
Mano fragment										1			1
Polished serpentine frag.										1			1
Pendant									1				1

Table 41

KR-57. Distribution of Subsurface Artifacts

Unit S9/W179

	0-10 cm	10-20 cm
Chalcedony		
Unmodified Flakes	1	1
Obsidian		
Bifacial Tools		2
Modified Flakes	2	5
Unmodified Flakes	205	73
Core Shatter	4	1

Unit NI/W182

	0-10 cm	10-20 cm
Chalcedony		
Unmodified Flakes	2	
Obsidian		
Bifacial Tools	1	
Modified Flakes	1	
Unmodified Flakes	35	9

Unit N49/W182

	0-10 cm	10-20 cm
Chalcedony		
Unmodified Flakes	4	
Obsidian		
Bifacial Tools	1	
Modified Flakes	9	
Unmodified Flakes	1887	29

KR-71

KR-71 is located upon a small flat area along a precipitous ascending ridge that rises abruptly from the base of a drainage containing a small permanent stream. The site is approximately 200 m above this stream, and commands a wide panorama of most of the drainage system.

Situated at an elevation of 2097 m (6980 ft), KR-71 is within a pinyon-juniper woodland, with the former species predominating. The site area is virtually devoid of any underbrush or grasses, although beavertail, sagebrush and assorted grasses were noted in the surrounding area.

THE SITE

KR-71 consists of an extremely diffuse flaked stone scatter approximately 30 m in diameter (800 m^2). In addition, a small midden area approximately 20 m long and 10 m wide (160 m^2) was located directly south of the datum point (Map 24). No surface features or ground stone milling equipment were observed at KR-71.

SURFACE COLLECTION

Four 10 x 10 m collection grids were constructed along a north-south, east-west axis from a datum point established within the observed center of the flaked stone scatter. All surface artifacts were collected from these grids. A low density of flaked stone material lay outside of these collection grids, and was collected as an extension of a particular quadrant (e.g., NW ext.). Distribution and quantities of all surface materials from KR-71 are presented in Table 42.

Flaked Stone

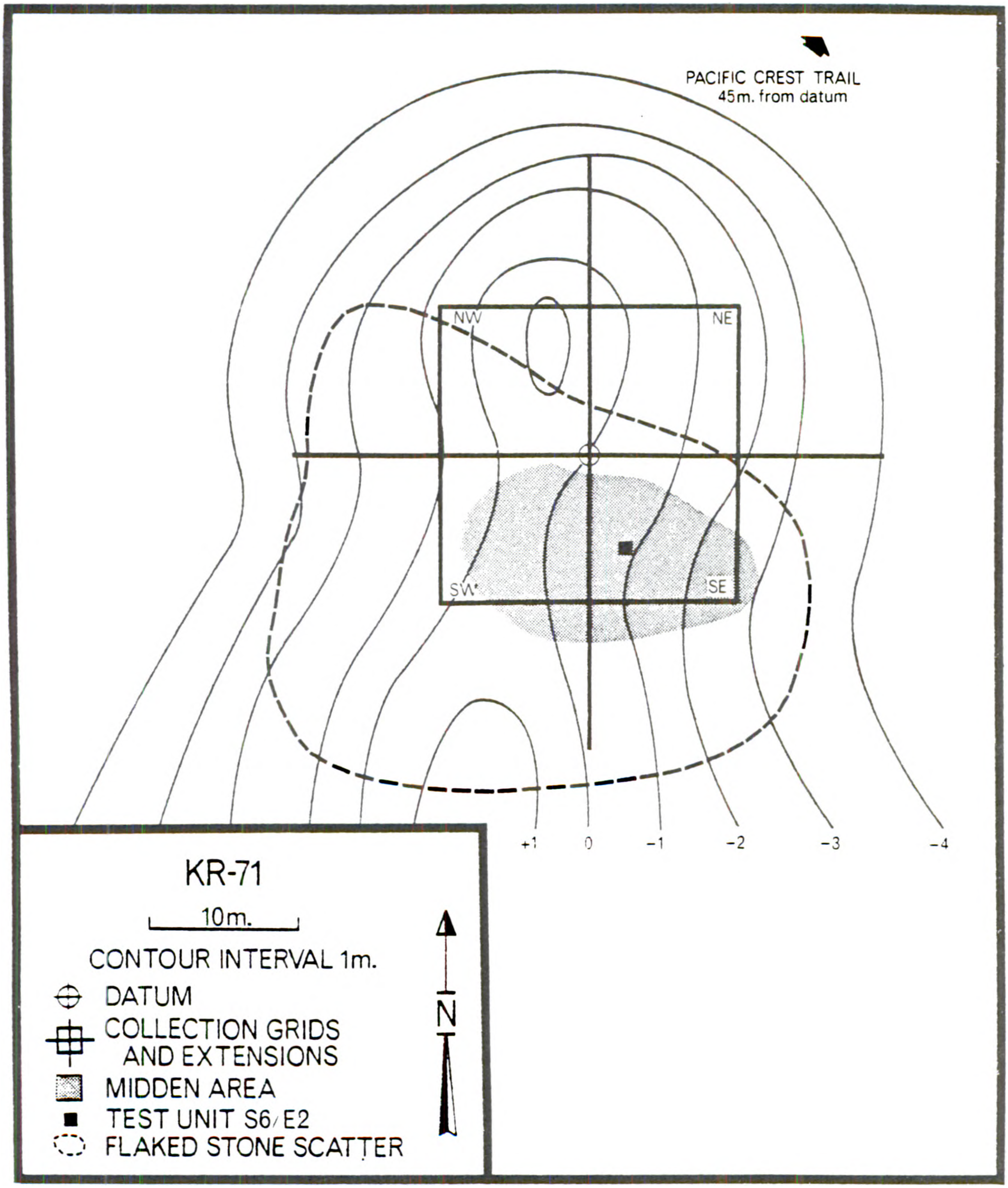
A total of 109 flaked stone items was recovered from the surface of KR-71. This represents an average flaked stone density of 13/100 m^2 of site surface area. Almost all of the flaked stone consisted of modified and unmodified obsidian flakes.

Projectile Point

A single Cottonwood Triangular projectile point was recovered from southeast 10 x 10 grid.

EXCAVATION

A single 1-m^2 test unit, S6/E2, was centrally located within the midden area at KR-71. This test unit was excavated in arbitrary 10 cm levels; all deposit was screened through one-eighth inch mesh.


PACIFIC CREST TRAIL
45m. from datum
NW
NE
SW
SE
+1
0
-1
-2
-3
-4
KR-71
10m.
CONTOUR INTERVAL 1m.
DATUM
COLLECTION GRIDS
AND EXTENSIONS
MIDDEN AREA
TEST UNIT S6/E2
FLAKED STONE SCATTER
N

Map 24

Stratigraphy

The upper 10-15 cm of deposit at test unit S6/E2 was dark grey-brown in color (Munsell color 10YR 4/2) and contained a quantity of charcoal and gravel. At the 15 cm level the deposit began to grade into a lighter color (Munsell color 10YR 3/2) with charcoal quickly decreasing in abundance. The unit terminated at a sterile serpentine substrate at 30 cm.

Flaked Stone

Only 20 flaked stone items were recovered from the 30 cm of deposit at test unit S6/E2. This inventory contained only unmodified obsidian flakes. The distribution and quantity of subsurface artifactual material are presented in Table 43.

Plant Macrofossils

An analysis of the charred plant macrofossils from test unit S6/E2 resulted in the following identifications:

S6/E2	0-10 cm	1 pinyon cone scale
	20-30 cm	1 pinyon cone scale fragment.

TEMPORAL PLACEMENT

The following source-specific obsidian hydration dates were obtained from test unit S6/E2 at KR-71:

Level	Cat. Number	Hydration Rim (Microns)	Date
0-10	71-033	3.73	A.D. 513
10-20	71-034	3.03	A.D. 766

The above dates tend to indicate a late Canebrake Phase (1200 B.C. - A.D. 600) and early Sawtooth Phase (A.D. 600 - A.D. 1350) occupation of KR-71 although this must certainly be considered tentative in view of the small sample of obsidian.

In addition, the recovery of a Cottonwood Triangular projectile point is indicative of a Chimney Phase (A.D. 1350 - A.D. 1850) occupation. No other datable material was recovered from KR-71.

SUMMARY AND FUNCTIONAL IMPLICATIONS

The internal constituents and environmental context of KR-71 are nearly identical to those of KR-50, and both of these sites are classified as temporary hunting camps. Most notable in the assemblages of both sites is the complete lack of portable and bedrock milling equipment or rock ring features, indicating the subordinate nature of vegetal processing.

Each site contains a relatively high percentage of formalized tools and modified flakes in relationship to unmodified flakes suggesting an elaboration of activities associated with hunting. However, even this activity was exceedingly sporadic as suggested by the overall paucity of flaked stone material.

Paradoxically, a small amount of midden containing charred pinyon remains was recovered from test unit S6/E2. The absence of any vegetal processing equipment would seem to indicate that the exploitation of pinyon was certainly not systematic, but may occasionally have served as a tertiary subsistence activity, possibly practiced by hunting parties utilizing KR-71.

Table 42

KR-71. Distribution and Quantities of Surface Artifacts

	NW 10x10	SW 10x10	NE 10x10	SE 10x10	NW Ext.	SW Ext.	NE Ext.	SE Ext.	Total
<u>Chalcedony</u>									
Bifacial Tools	-	-	-	1	-	-	-	-	1
<u>Obsidian</u>									
Bifacial Tools	1	-	-	-	-	-	-	1	2
Modified Flakes	3	3	-	4	2	4	-	2	18
Unmodified Flakes	2	10	-	27	10	18	-	20	87
<u>Projectile Points</u>									
Cottonwood Triangular	-	-	-	1	-	-	-	-	1

Table 43

KR-71. Distribution and Quantities of Subsurface Artifacts

Unit S6/E2

	0-10	10-20	20-30	Total
<u>Obsidian</u>				
Unmodified Flakes	10	20	-	30

KR-73

KR-73 is situated upon a small flat area along a precipitous ridge that rises abruptly from the base of a drainage containing a small permanent stream. The site, located at an elevation of 1975 m (6480 ft), commands a wide panorama of much of the entire drainage system. The parent geological formation of the ridge is meta-sedimentary serpentine, an extensive outcrop of which occurs at the northern boundary of the site.

KR-73 lies within a pinyon-juniper plant community, with the former species predominating. Other vegetation includes jeffrey pine, lupine, and sage. The proposed Pacific Crest Trail runs 35 m south of the site.

THE SITE

KR-73 consists of a rock ring feature and 16 associated artifacts (Map 25). There is a slight soil discoloration in and adjacent to the rock ring feature. No disturbances to the site were apparent.

SURFACE FEATURE

The single surface feature of KR-73 is an ovoid rock ring in the center of the saddle (Figure 14). It consists of a shallow depression outlined by numerous serpentine slabs. The ring's internal dimensions at its widest points are 2.5 by 4.5 m. A possible doorway is located along its southern edge (Plate 11).

SURFACE COLLECTION

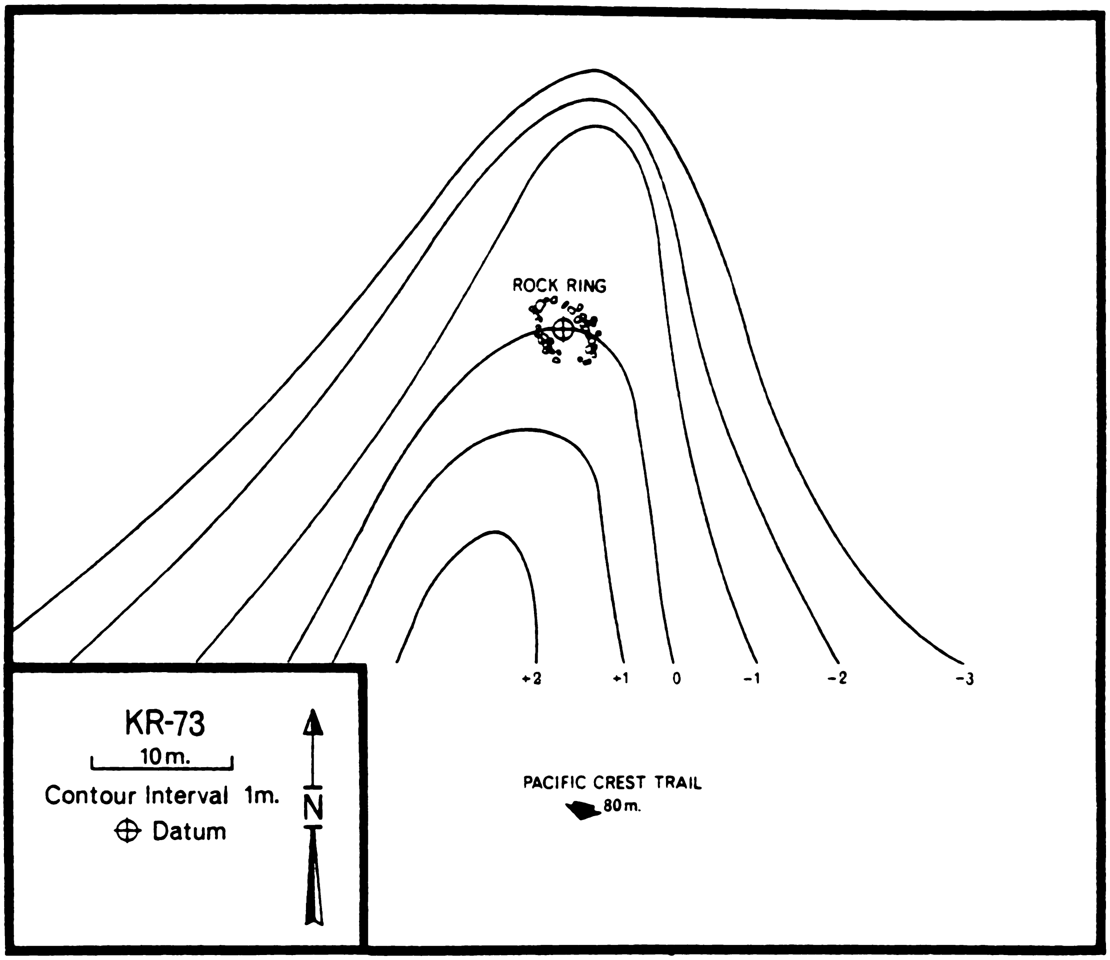
Due to the small number of artifacts, the site was collected as a single unit. The 100% collection was made easier by the open nature of the site and lack of plant detritus.

Flaked Stone

Twelve flaked stone artifacts were collected, all of obsidian. The assemblage is noteworthy in that nine of the artifacts exhibit post-detachment modification and, of these, five are formalized tools. Table 44 summarizes the various classes of these flaked stone items.

Projectile Points

Two projectile points were recovered from KR-73. One of these is complete enough to be classified as a Cottonwood Triangular type. The other is an unclassifiable point tip.



ROCK RING
+2
+1
0
-1
-2
-3
KR-73
10 m.
Contour Interval 1m.
Datum
N
PACIFIC CREST TRAIL
80 m.

Map 25

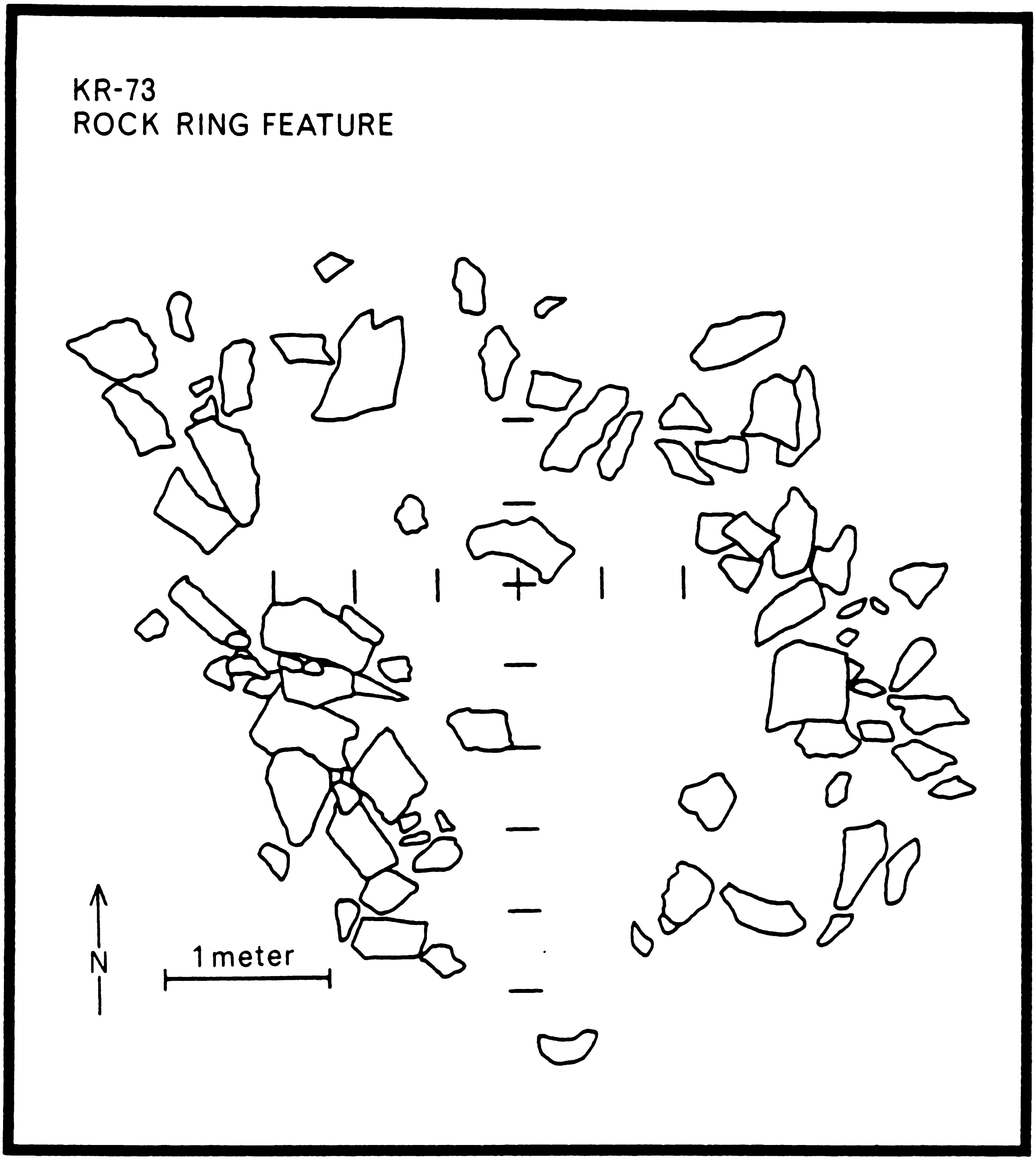


Figure 14

Plate 11. Rock ring feature at KR-73

Ground Stone

Only one surface ground stone artifact was collected at this site; a unifacial serpentine slab metate broken in two sections. The larger section, which contains the ground surface, measures 55 x 50 cm and is also 7 cm in thickness. The ground surface measures 22 x 18 cm. Adjacent to the ground surface is a pecked area 5 cm in diameter and .5 cm in depth. Both sections were found 4 m south of the southernmost extension of the rock ring.

Beads

One green cane glass bead was found within the rock ring.

EXCAVATION

Excavation at KR-73 was limited to the interior of the rock ring feature. The rock ring was divided along a central north-south axis; only the western half was excavated. The rock ring was excavated as a feature with its western interior perimeter and the baseline demarcating the excavation sample. Excavation was in arbitrary 10 cm levels and all deposit was passed through 1/8 inch screen.

Stratigraphy

The excavation uncovered a deposit only 13 cm in depth. The top 3 cm consisted of a dark grey-dark brown ashy midden (Munsell color 10YR 4/2). Below this was a second stratum, initially light brown to buff in color which graded into a light yellow soil upon a decomposing sedimentary bedrock.

Ground Stone Artifacts

Two unifacial manos were uncovered at KR-73. The first was discovered just below the surface, 20 cm north of the large serpentine slab lying on the surface of the rock ring (Figure 14). This mano was of a schist-like material and measures 17 x 9 cm and is 6 cm thick. The second, found directly underneath the serpentine slab mentioned above, is of a porphyretic material; it measures 16 x 8 cm and is 4 cm in thickness.

TEMPORAL PLACEMENT

Two time sensitive artifacts were discovered at KR-73: a Cottonwood Triangular projectile point (a type associated with a Chimney Phase) and a green cane bead dated by Bass and Andrews (1977) to A.D. 1810-1816 or later. On the basis of these two artifacts, KR-73 appears to be a rather late site, occupied sometime during the protohistoric/historic period.

SUMMARY AND FUNCTIONAL ANALYSIS

One aspect of the proposed subsistence-settlement pattern for this area is drawn from ethnographic accounts of small, temporary pinyon camps or "stations" (Voegelin 1938). These have been described as having been occupied by individual families from August to the middle of November. These stations were located within the pinyon grounds at higher elevations than the larger base camps, and characteristically had some type of simple shelter. Here the focus of economic activity was the procurement of pinyon nuts, although ancillary activities such as the hunting of game and the gathering of other readily available vegetal foodstuffs were also conducted. During a good harvest, a surplus of pinyons could be stored in cache pits and transported when needed down to the hamlets during the winter. The evidence from KR-73 is consistent with this model.

It is located at an elevation of 1975 m (6480 ft) and within a pinyon-juniper plant community. The rock ring feature at this site may have been the foundation of a shelter or a cache pit, although the associated artifacts found within the structure and an apparent doorway lend more support to the former interpretation. The presence of ground stone milling equipment (two manos and a metate) indicates a strong emphasis on vegetal processing (e.g. pinyon nuts).

The light, ashy midden area found at KR-73 may be associated with the preparation of pinyon nuts. Voegelin (1938:17) states that the cones were placed on a burning bed of sagebrush, causing the scales to open and expose the nuts. They were then removed from the fire, dried for a few days, and cached.

The high ratio of formalized tools and modified flakes to debitage indicates that little on-site manufacture or retouch of flaked stone items was performed. This is what one would expect from a site where all activities, including hunting, were secondary to the harvesting of pinyon. In addition, the number of artifacts from KR-73 seems to reflect a brief occupation by a small number of individuals. Little can be said concerning the exact nature of this group other than that both sexes were represented, based upon the presence of certain functional classes of artifacts (i.e., projectile points associated with male activities and milling equipment with female activities).

In conclusion, the archaeological assemblage at KR-73 is consistent with what is known from ethnographic accounts of a Tübatulabal temporary pinyon station. Because of its protohistoric temporal placement, KR-73 suggests a strong continuity between ethnographic Tübatulabal pinyon procurement accounts and preceeding prehistoric practices.

Table 44

KR-73. Surface and Subsurface Artifacts

	Surface outside rock ring	Surface inside rock ring	Subsurface inside rock ring 0-10 cm
Obsidian			
Bifacial Tools	2	-	-
Modified Flakes	4	1	-
Unmodified Flakes	3	1	-
Projectile Points			
Cottonwood Triangular	-	1	-
Ground Stone			
Manos	-	-	2
Beads	-	1	-

ROCK RING FEATURES

By T.B. Ruhstaller

One intriguing aspect of certain archaeological sites located within pinyon areas of the southern Sierra Nevada and western Great Basin is the presence of circular configurations of stones, or rock ring features. A number of uses have been suggested for these features; most often they have been categorized as temporary shelters or as pinyon caches. Criteria for the assignment of function to rock ring features is unsystematic and literature pertaining to this topic is scattered through a number of ethnographies, site reports, and journals. In this section we will summarize the pertinent ethnographic and archaeological literature in an attempt to abstract relevant criteria used in the assignment of function for rock ring features. These criteria shall then be applied to the six rock ring features recorded along the Bear Mountain Segment of the Pacific Crest Trail, resulting in a statement of their probable use.

Several ethnographic descriptions of certain groups in central eastern California provide examples of behavior which may help to explain the functions of rock ring features. Voegelin (1938) has stated that from September through the middle of October, the focus of Tübatulabal economic activity was the gathering and caching of pinyon nuts. While out collecting, single families would often erect a simple shelter (mohost) of wooden poles overlain with slabs of pine bark and brush. This structure served as both a storage facility and sleeping area in the event of inclement weather. The pinyon caches (paca·i·nist) were circular pits approximately 5 ft in diameter and 2 1/2 ft in depth. They were lined with either flat rocks or brush, and covered with flat rocks or grass and small stones.

In an early account of a Panamint Shoshone pinyon camp, Dutcher (1893:377) describes their shelters as being small, circular "corrals" made up of pinyon braches and brush. Each circle was eight to ten feet in diameter and could accommodate a single family. Coville (1892:353) in his discussion of this same group mentions that pinyons were cached in dry areas among the rocks. According to Steward (1933:242), the Owens Valley Paiute would store pinyon cones in "bins" which were lined with rocks and covered with pine needles, boughs and rocks. The Kuzedika Paiute of Mono Lake (Davis 1965:10 and 12) employed a similar pinyon cache consisting of a shallow pit, seldom more than six feet in length, surrounded by retaining stones. As in the previous examples, grass, pine boughs and stones were used to protect the cache.

A number of discussions exist which describe the archaeological manifestations of rock ring features. In the Owens Valley, Steward (1933) and Meighan (1955) mention the presence of these rings and both feel they are the outlines of former habitations. Davis (1964 and 1965) observed these features during her surveys in the Mono Basin. Unfortunately, her description is quite brief, commenting only that the rings representing pinyon caches were markedly smaller than those utilized as windbreaks or shelters.

More recent surveys provide additional archaeological data concerning rock rings in this area of California. Near Casa Diablo in central-eastern California, seven rock rings were recorded and excavated (Cowan and Wallof, 1974). All were rather small; the interior diameter of the largest measured less than two meters and they contained little or no

cultural material. From this evidence and their discussions with a local Paiute informant, Cowan and Wallof believe all these features are the remnants of former pinyon caches.

Based on data gathered during his Owens Valley survey, Bettinger has discussed the occurrence of rock rings in several articles. In the first (1975), he describes a rock ring 3 m in diameter associated with a number of well-preserved aboriginal wooden structures ranging from 2 to 8 m in diameter. Bettinger is unsure whether this feature represents the remains of a former wooden structure or a pinyon cache although it is interesting to note that none of the wooden structures, either standing or collapsed, are described as having any rock ringed foundations. Milling stones were found in direct association with the two standing structures but no other artifacts were associated with the rock ring. Bettinger believes sites such as this represent winter villages occupied during years in which the pinyon harvest was too large to transport to permanent villages at lower elevations. If this was the case, it may help to explain the relatively large size of this rock ring if it did indeed function as a pinyon cache.

In a more extensive account of his investigations, Bettinger (1975) describes a total of 115 circular, rock ring features. The majority of these features were located in pinyon areas. He considers them to be an integral component of pinyon camps, along with the ground stone and other artifacts. No clear cut differences were noted among these various features and no detailed functional differentiations were attempted. Bettinger does feel, however, that:

> "Further investigations of similar features will probably disclose characteristics by which each structure can be distinguished. It is likely, for example, that the smaller floors represent caches since some are too small to be inhabited. Likewise, artifacts associated with these features should provide some clues to their use" (1975).

The work of Garfinkel et al. (1979) provides rock ring data from sites located along the Morris Peak and Lamont Meadow Segments of the Pacific Crest Trail immediately to the southeast of the Bear Mountain Segment. These sites, therefore, provide data that are particularly pertinent to the present study. A total of 14 rock rings were discussed in that report, 12 of which were excavated. Although surface and subsurface constituents were considered, Garfinkel and his associates divided the rings into functional types primarily on the basis of their size and configuration.

Seven of the rock ring features were interpreted as the remains of former dwellings. These have an average internal diameter of approximately 3 m. In addition, 5 of the 7 rings exhibited possible entrances. Surface and subsurface artifactual material was present in only two instances. Six other rings were described as pinyon caches. These features were characteristically smaller than the "house rings"; with interior diameters averaging less than 2 m. In addition, only one of these features possessed any artifactual material.

Two additional archaeological studies, one from the Washo area of western Nevada, and the other from the western Shoshone area of central Nevada, provide still more data concerning rock ring features. Although

outside of our immediate study area, these ethnographic groups were known to have harvested and cached pinyon nuts in much the same manner as that already detailed for aboriginal groups of central-eastern California (Price 1962; Steward 1941).

In his description of a Washo pinyon camp, Fenenga (1975) describes four features from a site located on a ridge in the pinyon-juniper community. One of these is a rock ring feature with a diameter a little over 3.5 m which Fenenga interprets as a habitation structure. This stone circle is set among trimmed junipers. A cut and trimmed pole, which Fenenga believes to have acted as a support for a conical wooden superstructure, was found in direct association with this feature. Although no other artifacts were found in the immediate vicinity of this ring, other artifacts at the site included numerous historic items, as well as many non-white articles, e.g. flaked and ground stone artifacts, pinyon "hooks", burden baskets and a bow.

Finally, research conducted by David Thomas (1976) in the Reese River Valley in central Nevada revealed some 40 stone circles at 65 sites situated along the pinyon ecotone. These features ranged from 2 to 7 m in diameter with the majority being interpreted as "house rings" based upon their size and associated artifacts. The floor of one of the largest and best preserved of these rings, house ring A at the Flat Iron Ridge site, was excavated. Two grinding stones were located a short distance from the ring itself, and artifacts within the circle included numerous historic items, some flaked stone debitage, faunal remains and 60 glass beads. Subsurface features included 2 hearths and 8 postholes. Of the remaining stone circles, only one was mentioned as having possibly been used as a pinyon cache. This interpretation was based upon the ring's small size, although its dimensions were not given.

From the foregoing discussion, three general sets of criteria appear to offer the greatest utility in inferring functional characteristics of rock ring features. These criteria involve consideration of:

1) average interior diameter of the features,
2) the architectural, or design characteristics of the features, and
3) the frequency and distribution of any associated surface and subsurface artifacts and/or features.

The average interior diameter of a rock ring feature is the most frequently used criteria for inferring function. In general, rock ring features with interior diameter less than two meters are considered to have been too small to serve as living quarters and, therefore, must have served as a cache or storage facility. Larger rock ring features, especially those that are three meters in diameter or larger, undoubtedly served as habitation structures.

Several architectural characteristics, such as the presence of gaps along the stone courses which are interpreted as "entrances," provide obvious functional information. In addition, a profuse of stones, either within the subsurface interior of the feature or adjacent to features on the surface, can be interpreted as lining and/or covering material to protect cached pinyon. In much the same way, a purposeful construction of a cache on a bedrock substrate will also protect the contents from burrowing rodents.

Few, if any, artifacts would be expected to be found in conjunction with pinyon caches. On the other hand, rock ring features that functioned

as shelters may be associated with a number of surface and subsurface artifacts including flaked stone, ground stone, and beads. In addition, such shelters may also exhibit subsurface features such as hearths and postholes.

With the above set of criteria in mind, tentative functional categories can be postulated for the rock ring features occurring along the Bear Mountain Segment:

	Pinyon Cache	Temporary Shelter
KR-43	+	
KR-44	+	
KR-60 Feature 1	+	
KR-60 Feature 2		+
KR-60 Feature 3	+	
KR-73		+

All four rings designated as pinyon caches were uniformly small with average interior diameters generally not exceeding two meters, and possessed no doorways. Covering or lining material for caches was apparent at KR-43 and Feature 1 at KR-60. At KR-43 a large concentration of quartzite cobbles were found in the subsurface interior of the ring, suggesting an interior lining for protection against rodents. The profusion of granitic rocks adjacent to Feature 1 at KR-60 (Plate 13) appears to be more indicative of a cache covering that was spread asunder during retrieval of the stored contents from the cache. All four features suggested to have functioned as caches were constructed immediately atop a granitic bedrock substrate, which, as with an interior rock lining, may have protected against rodent intrusion. Finally, surface collection and excavation yielded relatively little artifactual material from these features.

Like the features mentioned above, Rock Ring Feature 2 at KR-60 was relatively small, possessed no doorways, and was constructed on a granitic bedrock substrate. However, this feature is unique in two important respects. First, a grinding slick was located atop one of the stones defining the perimeter of the feature. Secondly, this feature's 30 cm of deposit contained over 130 flaked stone items, the bulk of which were unmodified waste flakes. This was more material than was collected for the entire site. These factors argue persuasively that rock ring Feature 2 at KR-60 functioned as a temporary shelter.

The other rock ring feature postulated to have been a temporary structure was located at KR-73. This feature measured 4.5 x 2.5 m along axial lengths, larger than any other rock-ring feature located along the Bear Mountain Segment. In addition, a possible entrance was observed along the southern perimeter. Surface collection and excavation yielded a glass bead, a projectile point, three flaked stone artifacts, and two manos. A large slab metate was located a short distance (two meters) from this rock-ring feature.

Plate 12. Rock Ring Feature 3 at KR-60 appears to have been constructed over a relatively flat granitic substrate possibly as a means of protecting stored pinyon from burrowing rodents.

Plate 13. Rock Ring Feature 1 at KR-60. Similar to Rock Ring Feature 3, it is constructed on a smooth granite substrate. The profusion of granite slabs found adjacent to the feature are inferred to have functioned as a lining or covering to a prehistoric pinyon cache.

MILLING EQUIPMENT

This section will describe and analyze that class of artifacts typically identified as functioning in the preparation (crushing, pounding, grinding, and milling) of vegetal foods. These artifacts include two classes of bedrock features: mortars and metates, and more portable items: pestles, manos, and metates.

The first section will present a description and classification of the milling equipment identified during the field reconnaissance of the Bear Mountain Segment. 15 archaeological sites were examined. In the second section functional inferences are made based on ethnographic data available for the Tübatulabal and on archaeological considerations.

Bedrock Features

Mortars (Table 45)

Of the 15 sites investigated five contain surface bedrock features with mortars. These mortars are all relatively shallow with depths ranging from .9 to 11.9 cm and diameters from 4.5 to 12.8 cm. Several mortars have bedrock metates (grinding slicks) directly adjacent to them. Over half the mortars identified were at a single site, KR-57.

Metates (Table 45)

Seven sites contain bedrock features determined to be metates or grinding slicks. These items are slight depressions with slickened or polished surfaces found on granite boulders and outcrops of the granite bedrock and are produced by milling activities on these granular stone surfaces. They are difficult to recognize or formally delineate as they are relatively inconspicuous. In most instances large areas of boulders bear slickened surfaces which blend into large milling areas rather than discrete grinding features. The areas of milling activity range in size from 21 by 26 cm to 50 by 77 cm. The greatest number of bedrock metates (49) were found at KR-41. Second in quantity was KR-57 where 15 bedrock metates were identified.

There is an inverse correlation between the presence of bedrock metates and portable metates. When bedrock metates are present, portable metates are absent and vice versa which is illustrated diagrammatically in Figure 15. This relationship is undoubtedly a result of the efficiency with which the exposed granitic substrate can be used for milling activities. When this substrate is absent, portable milling equipment must be substituted.

Portable Milling Equipment

Pestles (Table 46)

A small number (5) of pestles were identified during the present study. Two of these items came from subsurface contexts of KR-39 and are both incomplete. The other pestles are complete specimens found in association with bedrock mortars at three different localities: KR-42, -44, and -57.

Table 45

Distribution of Bedrock Grinding Features

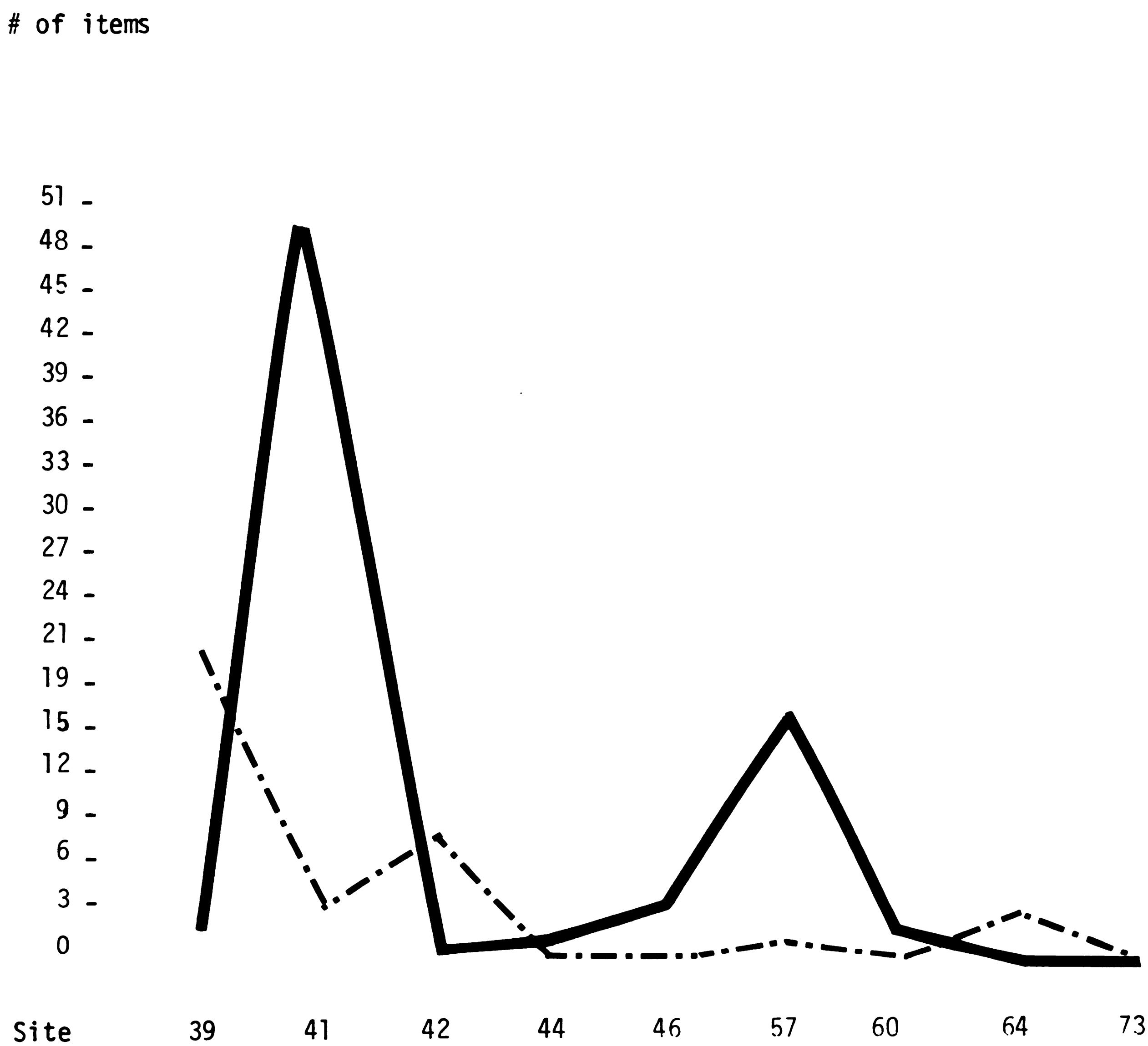
Site	Mortars	Metates	Total
KR 39	-	1	1
41	2	49	51
42	2	-	2
44	1	1	2
46	-	3	3
57	12	15	27
60	5	2	7
Total	22	71	93

Figure 15

Relationship of Bedrock to Portable Metates

Bedrock metates ——————

Portable metates ----------



These pestles may be divided into two types based on the degree of purposeful shaping which characterizes a specimen.

There are three unshaped specimens composed of granite or diorite which varied in size from 13.5 to 24.5 cm in length and 4.0 to 10.7 cm in width. The remaining two items have varying degrees of shaping. The least well formed is a specimen of granite which was found in situ at site KR-60. It measures 18 cm in length and 9 cm in width. The most formalized pestle made of talc-rich schist was identified in a subsurface context at KR-39. It is incomplete and has been broken lengthwise.

Manos (Table 46 and Figs. 16 and 17)

A total of 12 items from five sites have been identified as manos. All of the seven complete specimens and three of the fragments are of granite. The two other fragmentary manos are composed of schist and an unidentified felsitic material.

This small sample of manos does not easily separate into formal types as each complete specimen seems to exhibit a distinctive form. A broad categorization on the same basis as that used for pestles exists, that is a division between shaped and unshaped specimens. Only three specimens exhibit formal shaping.

The dimensions of the manos found in this small assemblage indicate a great deal of variability in size. The smallest one measures 8.9 cm in length, 8.2 cm in width, and 4.1 cm in thickness. The two largest manos co-occur at KR-73 in association with a rock ring (Figs. 16 and 17). They are almost identical in size measuring 15.7 and 17.3 cm in length, 9.4 and 8.2 cm in width, and 5.0 cm in thickness.

The forms of the manos appear quite variable. The sample includes specimens which are ovoid, triangular, and rectangular in cross-section. Four manos are complete enough to determine that they were used unifacially, and four were used on both faces.

Metates (Table 46)

This category includes 38 items which are relatively flat and have either one or two faces which exhibited grinding and/or pecking. Fifteen specimens falling into this category are too incomplete to classify. Of those remaining items three classes of ground stone artifacts can be differentiated based on size and gross morphology: large unshaped slab metates, portable metates, and small anvil or "rub" stones.

Slab Metates. Four artifacts are classified as slab metates (KR-39:3, KR-41:1). Each of these consists of an unshaped laminar fragment of granite or diorite having a grinding surface on one face only. These specimens are large and heavy. Average dimensions for these items are 46.3 x 24.5 x 9.0 cm.

"Portable" Metates (Fig. 18). Portable metates fall into a class of ground stone which includes items substantially smaller than those considered as slab metates. The artifacts exhibit either one or two grinding surfaces which range in form from relatively flat to markedly concave. These items range in size from 23.5 to 26.4 cm in length, 10.3 to 25.5 cm

Table 46

Distribution of Portable Milling Equipment

Site	Pestles	Manos	Metates	Total
KR-39	2	4	20	26
KR-41	-	3	4	7
KR-42	1	1	9	11
KR-44	1	-	-	1
KR-57	-	2	1	3
KR-60	1	-	-	1
KR-64	-	-	3	3
KR-73	-	2	1	3
Total	5	12	38	55

in width, and 1.9 to 5.2 cm in thickness. Only ten items are complete enough to allow classification as portable metates (KR-39:9, KR-41:1).

"Rub" Stones. This subtype consists of seven specimens (KR-39:4, KR-41:1, KR-64:2) which are uniformly smaller than either the slab or portable metates and exhibit grinding or pecking unifacially. The ground or pecked surface is only slightly concave or completely flat. Six of the specimens are slate and one schist.

Two objects (64-001, 64-009) are complete and are very similar in size (Fig. 18). They measure 13.2 and 14.3 cm in length, 9.2 and 9.4 cm in width, and 2.5 and 1.8 cm in thickness. The other fragmentary artifacts range in size from 7.9 to 11.4 cm in length, 7.2 to 10.8 cm in width, and 1.3 to 2.5 cm in thickness.

Ethnographic and Archaeological Considerations

Milling equipment is a difficult order of data to evaluate functionally on more than a gross level. Most archaeologists have been content to say that grinding and pounding tools served to process and prepare vegetal foods. However, if a relationship may be determined between the type of milling equipment and the kind of vegetal foods processed, rough estimates could be made regarding the relative importance of specific plant foods at various sites. Although exact relationships probably did not exist, general tendencies can be discovered using ethnographic, botanical and artifactual evidence.

Ethnographic sources point to a wide variety of methods for the preparation of vegetal foods although only a few very general types of grinding implements were used. For the Tübatulabal, Voegelin (1938:17) identified four types of milling equipment: mortars (pahal), including pit (bedrock) mortars; pestles (poho'owal) of granite or slate cobbles; grinding slabs (mana.l), of granite or black slate, used on one side only; and rub stones of small (takibit) or large (takit) size.

These tools were used to process a variety of vegetal foods. All plant foods whose preparation techniques are described ethnographically are listed in Table 47. According to Voegelin, pit mortars and grinding slabs were used to prepare most varieties of nuts, seeds, and berries. Acorns were processed in deep pit mortars, and meat was sometimes pounded on a flat rock (metate ?) or in a mortar. Given this ethnographic information, we have a most insecure basis for inferring from the artifactual remains which particular plant foods were processed with which particular tools. Even so, certain patterns are worthy of mention.

Acorns (all types) are described ethnographically as being pounded in mortars. Archaeologically, features associated with acorn processing usually exhibit deep conical pits. The bedrock mortars identified in the present study are quite shallow. In a previous study (Garfinkel *et al.* 1979) several sites with bedrock features exhibited deep mortar holes. These were in an area ethnographically described (Voegelin 1938:18) as a favored acorn (*Quercus chrysolepis*) collection area. Directly adjacent to one of these features were several Black Oaks (*Quercus kellogii*), also an important source of acorns. The sites investigated in the present research area are not associated with large stands of either of these types of oak. Because of the absence of deep pit mortars and the scarcity of acorns, the processing of acorns at the study sites seems unlikely.

Table 47

Ethnographically Described Preparation Techniques for Vegetal Foods

Food	Techniques
acorns	Pounded in pit mortars.
pinons, roasted	Gently crushed on grinding slab with rub stone.
pinons, white mush	Milled with large rub stone.
pinons, black mush	Pounded in pit or portable mortar.
Digger pine	Cracked on grinding slab and milled in pit mortar.
small seeds: chia and wild oats	Pounded in pit and portable mortars.
Mentzelia (*Ku·l*)	Milled on grinding slab.
bunch grass or Polypogon	Milled on grinding slab.
juniper berries	Pounded in pit mortars.
boxthorn berries	Pounded in pit mortars.
manzanita berries	Milled on a grinding slab or pounded in a mortar.

Abstracted from Voegelin 1938:18-19.

Researchers have suggested that mortars and pestles were rarely if ever used to process pine nuts, because this procedure is inefficient in reducing nuts to meal due to the resinous quality of the seeds. They suggest that the mano and metate were the preferred tools for pine nut preparation. In contrast Voegelin (1938:17, 18) indicates that portable mortars were taken on pinyon collecting trips by the Tübatulabal and that pinyon and digger pine were pounded into meal by this procedure. However, due to the overwhelming representation of manos and metates within the assemblage recorded during the course of the current research effort, it would seem likely these implements were more commonly used in processing pine nuts. A small anvil stone was first used to crack the nuts, or nuts were shelled by rubbing them gently over a grinding slab with a mano. Undoubtedly, the types of metates classified as anvil or "rub" stones are items used in the above procedure. The majority of larger grinding slabs classified as slab metates or "portable" metates and bedrock metates were, most probably, sometimes used for the milling of pine nuts.

Seeds from grasses, certain annuals, and berries, are the remaining plant foods processed by milling tools. Though not the major vegetal foods collected, they did play an important role in the subsistence base. These foods would be processed by milling or pounding, most likely in shallow mortars.

MILLING EQUIPMENT

Fig. 16. Milling Equipment

a. Bifacial shaped mano (42-565)

b. Bifacial shaped mano (39-074)

c. Unifacial unshaped mano (73-001)

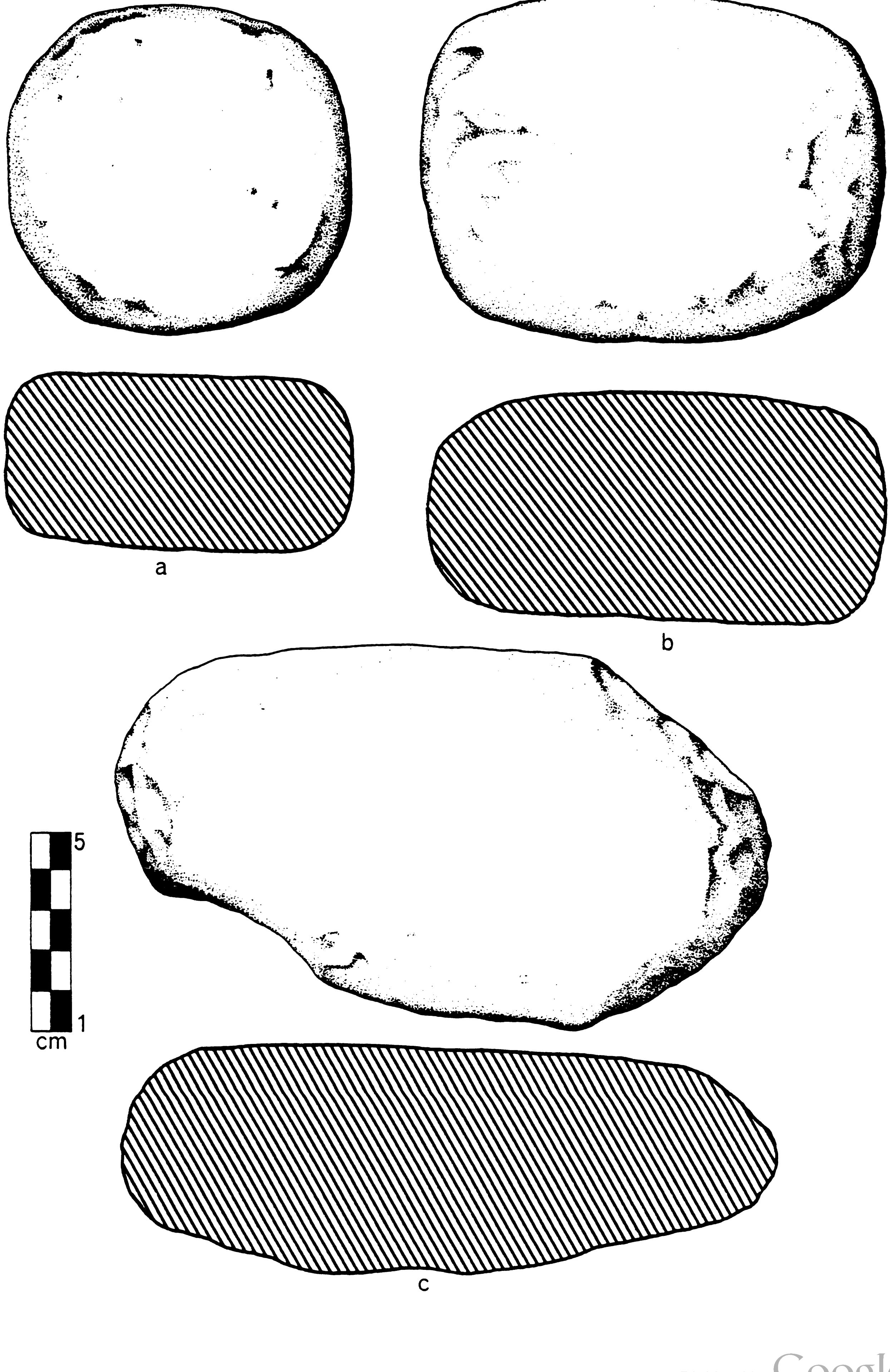

a
b
5
1
cm
c

Fig. 17. Milling Equipment

a. Bifacial shaped mano (39-366)

b. Unifacial unshaped mano (73-002)

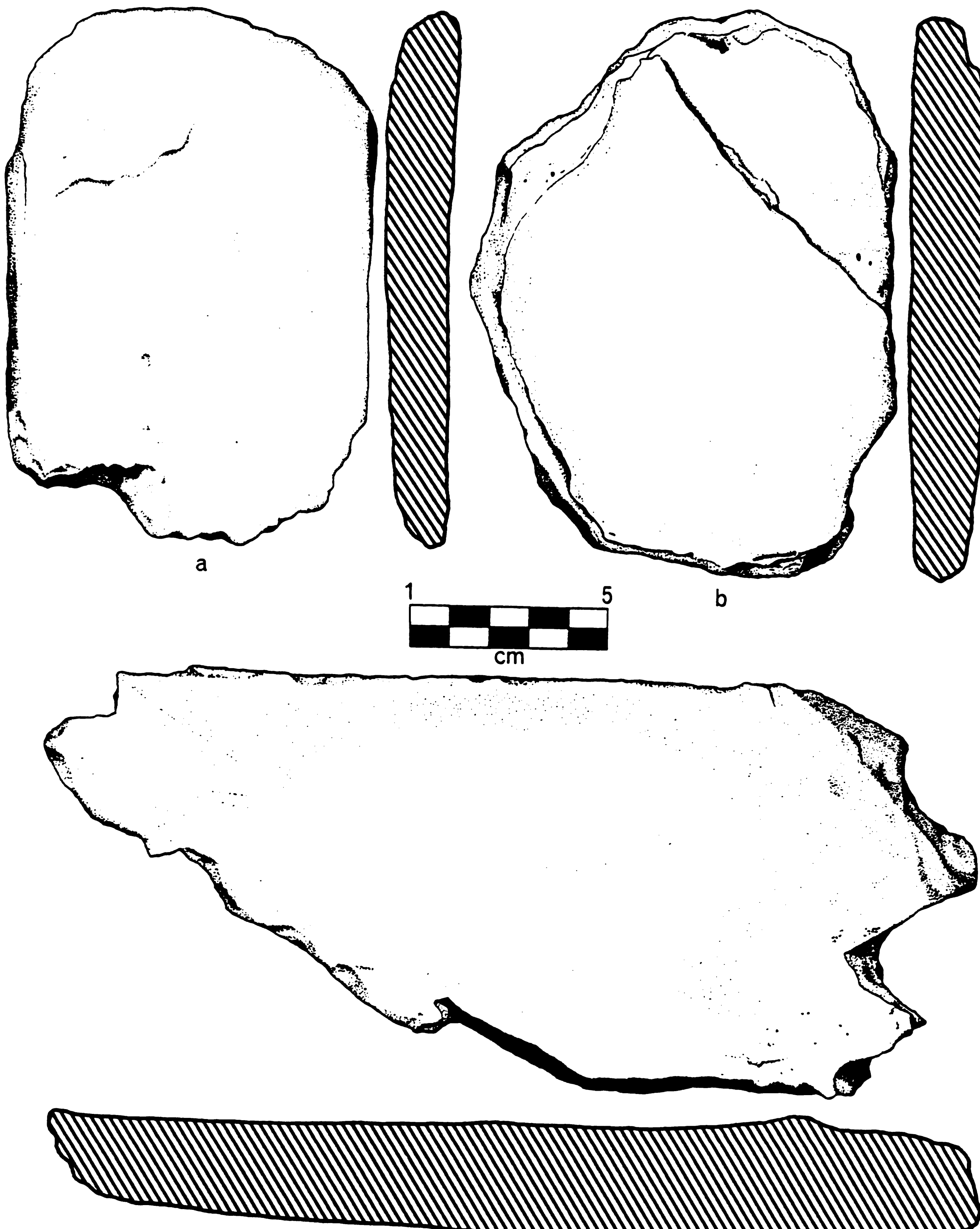

a
5
1
cm
b

Fig. 18. Milling Equipment

a. Rub stone (64-001)

b. Rub stone (64-099)

c. Portable bifacial metate (39-764)


a
1
5
cm
b
c

FAUNAL ANALYSIS

by

Mark Basgall

California faunal analysis has been plagued by inadequate and insufficient research. Too often, studies, when pursued at all, have gone only so far as providing species lists, minimum number of individual lists, etc. Rarely has the investigator attempted to build a complete model of faunal exploitation, taking into account the ethnographic record, animal behavior and distribution, relative meat/protein value, etc., as well as the excavated archaeological data. Because of this lack of rigor, the level of California faunal analysis has lagged far behind that accomplished in many other parts of the world. It is time to develop encompassing exploitative models for the many diverse ecological and cultural areas of California. They must be accurate and complete enough to stimulate and guide further, perhaps more detailed, analyses.

The present section will attempt to develop such a model of animal exploitation for a limited part of California, that of the southern Sierra Nevada, in an area represented by Lamont Meadow/Morris Peak and Bear Mountain Segments of the Pacific Crest Trail. The faunal sample collected during the archaeological investigations of the Lamont Meadow/Morris Peak Trail segments has already undergone some analysis (Basgall and Hildebrandt 1979), though this was of an incomplete nature. Due to a small sample size, and the lack of a regional model, hypothesis formulation and testing was limited to very basic questions. These research questions dealt with prediction of the economic importance of prey species based both upon seasonal and more general distribution, as well as their ease of procurement as reconstructed from the ethnographic record. In addition, relative meat values of particular species were considered when making predictions of dietary importance. Following the elaboration of these hypotheses, they were tested against the archaeological record. Results indicated that those taxa locally available with high protein value and ease of procurement were most commonly and extensively represented in the faunal assemblage. Unfortunately, this analysis stopped short of creating the complete model alluded to above. This shortcoming will hopefully be rectified in the present study.

The major goals of the analysis of faunal remains recovered from the current research effort are twofold. First, a regional model for faunal exploitation in the southern Sierra Nevada will be developed utilizing specific ethnographic data from the Tübatulabal, Little Lake Shoshone, and Kawaiisu, more general ethnographic information, as well as pertinent information on animal behavior and distribution, meat/protein value, and procurement ease. The model developed will be tested against the archaeological record as documented along the Lamont Meadow/Morris Peak and Bear Mountain segments of the Pacific Crest Trail. Second, the primary question posed by the project research design will be addressed; that is, how are differences in subsistence-settlement site type exemplified by differences in the various faunal inventories? This is based upon the archaeological corollary that prehistoric cultural remains are the result of patterned human behavior, and as such, the constituents of a site should be a reflection of that site's utilization. Both of these research problems will be elaborated upon further.

Methods

Following the tenets of the research design, faunal material was collected from all sites excavated/surface collected. Midden material was sieved through 1/8" screen mesh, and all animal remains were removed. Upon recovery, bone was catalogued according to proper provenience.

Laboratory analysis consisted of the following. First, a rough sort of all bone was made into components of identifiable (ID) and unidentifiable (UNID). Identifiable bone included that which was definable to taxonomic group (species where possible) and bone element (unique element where possible). Unidentifiable bone was all other osseous material. Following this preliminary division, ID bone was segregated according to proper taxa/element, while UNID bone was further broken-down into categories based upon size (large mammal versus small mammal) and burning condition (burnt versus unburnt).

Upon finishing this classificatory procedure all faunal material was quantified. There has been much concern in recent years in archaeological faunal analysis with respect to proper quantification techniques. There are 3 basic methods in use at present (others being derivitive of them): (1) the minimum number of individuals (MNI) method, which uses the most common unique bone element per taxa as the measuring unit (cf. White 1953). Various elaborations of the technique have been proposed in attempts to increase the raw MNI value using such criteria as age, sex, size, and pairing (cf. Bokonyi 1970; Casteel 1977a, b, 1978; Chaplin 1971; Flannery 1967, Drantz 1968; and Smith 1975); (2) the raw bone count (E) method, which utilizes the total number of identifiable bones per taxa as the unit of measurement (cf. Chaplin 1971; Zeigler 1973); and (3) the weight method, which uses as its unit of comparison the total bone weights per taxa. This can be done using raw weight values (cf. Chaplin 1971), or it may be corrected for the differential edible meat ratios (cf. Zeigler 1973)(average edible meat weight to average skeletal weight) maintained by different species.

Without conducting a complete survey of the criticisms which can be addressed at each method, suffice it to say that all possess major shortcomings. However, some techniques are weaker than others (for more detailed considerations of quantification problems see: Basgall and Hildebrandt 1979; Casteel 1977a, 1978, 1978b; Grayson 1973, 1974, 1978; Guilday 1970; and Perkins 1973). This author feels that the two strongest quantification methods are those of raw bone counts and edible meat weights (Basgall 1979a, 1979b; Basgall and Hildebrandt 1979; Simons and Basgall 1978). These techniques were used in the analysis of faunal material recovered from the Lamont Meadow/Morris Peak Trail segments and will likewise be used in the present study.

Behavior of Primary Economic Taxa

Mule Deer (*Odocoileus hemionus*)

The mule deer is primarily a forest-edge species, generally avoiding dense climax forest. They will, however, often inhabit communities

which are characterized by brush-chaparral vegetation. The size of social units varies with seasonal availability of resources, but the standard unit consists of a family group of an adult female and her young. Buck groups as well as many solitary animals may be present in addition. Large aggregations of deer will only form during periods of stress, such as "yarding" during winter seasons (Severinghaus and Cheatum 1956; Simons 1973).

Simons (1973) has characterized deer as ascribing to a "Cervid Model" of artiodactyl behavior. Taxa fitting this model exhibit large degrees of solitary behavior, with matrifocal family groups being the rule. Mule deer, however, appear to be a bit more sociable than other artiodactyls falling within the cervid model. Since their behavioral patterns stress solitary or micro-group composition, one would predict that solitary hunting/stalking would be the most efficient procurement strategy under general conditions. Ethnographic data support this inference (Flannery 1966, 1967; Heizer and Baumhoff 1962), and communal-type hunts are only recorded rarely seeming to occur only when deer are aggregated due to environmental stress. Such situations occur when large numbers of deer move down from high elevations along migration trails because of early snow conditions, or during winter "yarding" behavior (Driver 1937; Heizer and Baumhoff 1962; Steward 1933, 1938).

In terms of seasonal fluctuations in temperature and rainfall the vegetation regimes change; thus, deer feeding habits and general behavior follow suit. In the spring, grasses form a major part of the diet and as the snowline recedes, the animals disperse from winter range and move to higher elevations as fresh shoots appear (Leopold, et al. 1951).

With summer, many shrubs and forbs become available, which results in the maximal yearly population dispersal. Longhurst, et al (1952) estimate the density at this time to be between 5 and 9 individuals per square mile in the study area. Usually in July, does drop their fawns (Bischoff 1957), and this "crop" is large, replacing an average 32 percent annual loss (Leopold, et al. 1951).

The autumn frosts institute an abrupt migration from high elevations to the lower shrub areas and, as winter snows cover higher elevations, succulent vegetation is greatly reduced so that trees/shrubs (including acorns) form at least 75% of the diet (Hill 1956). Due to this reduction in available forage, the winter range is quite small. For example, the winter range of the Jaw Bone deer herd (near Yosemite) is estimated at 1/7 the size of the summer range (Leopold, et al. 1951). If a similar relationship holds for the southern Sierra, the winter population should rise to approximately 50 animals per square mile where aggregated, and virtually no animals elsewhere.

Once settled in the winter range, the deer eat the best vegetation first, which results in the late winter food supply being of vastly inferior nutritional value. This period is then the limiting season: the quality and amount of winter forage determines the carrying capacity of the entire yearly range (Leopold, et al. 1951).

Mountain Sheep (Ovis canadensis)

Mountain sheep prefer a rugged habitat where visability is good, and where there is little competition from other grazing animals. Size

of the social unit varies seasonally in response to resource availability and reproductive behavior. During most of the year three general units occur: family bands, 2-20 individuals composed of adult females, young, and yearlings; ram bands of 2-10 individuals; and solitary animals (Geist 1972; Simons 1973).

Simons (1973) characterizes artiodactyls such as mountain sheep as belonging to the "Marginal Ungulate Model." These animals possess some kind of discrete home range which is occupied only by one unique band. The home ranges are passed from one generation to the next, resulting in great ancestral continuity within any one area (Geist 1972). Likewise, the mountain sheep disperse very slowly from these band-specific ranges, and Thomas (1972) suggests that if a band is wiped-out in a localized territory, that area would be slightly, if ever, reoccupied. This condition might tend to prevent over-exploitation by human predators.

In direct accord with mountain sheep behavior, several methods were used for hunting them. These include: individual stalking; driving past a concealed hunter or hunters; ambush, either by individuals or groups; and corral hunts by task-specific hunting groups (Heizer and Baumhoff 1962; Simons 1973; Thomas 1972).

As noted above, sheep social behavior is seasonally dependent. In the spring the sheep begin moving up in elevation (from lower-elevation winter ranges), eating sedges, grasses, and alpine forbs. During the summer they continue to seek similar foods, moving as little as possible, even within their home range (Jones 1950). Throughout most of the year, rams of 2 years or older run independently of the ewes, yearlings, and lambs; either alone or in bands of 2-10 animals. Preceding the fall rutting season, rams form large herds. In late fall mating occurs and groups of 5-15 mixed-sex individuals form for the winter; it is only during this period that ram and ewe bands coalesce. Lambing occurs in late May and/or early June, during which time the ewes are again isolated from males (Capp 1968; Geist 1972; Jones 1950; Simons 1973).

Pronghorn Antelope (<u>Antilocapra</u> <u>americana</u>)

Pronghorn antelope originally ranged over large parts of western North America, inhabiting for the most part, the high grassland/plain areas. Dense populations once lived in the Central Valley of California and, to a lesser extent, on the high plains east of the Sierra Nevada (McLean 1944). In addition, they were found in smaller valleys with ample grassland such as the Kern River drainage. Their feed today consists largely of cacti, greasewood, sagebrush, grasses, and other desert/grassland plants (Ingles 1965).

Simons (1973) has characterized antelope under the rubric of an "Antilocapra Model" of artiodactyl behavior. During most of the year these animals associate in small- to medium-sized bands, however, at some time during the year, usually while under environmental stress, large herds of several hundred or thousand animals form (Simons 1973). Due to the typically large/semi-large aggregations of these animals which form, one would predict communal hunts as being an efficient procurement technique. Ethnographic data support this inference (Flannery 1966, 1967; Frison 1971; Heizer and Baumhoff 1962; Steward 1938); most ethnographies

indicating that antelope were primarily taken by communal task groups. It is important to note, however, that these animals do not replenish their numbers quickly. Drives, to be successful in the long run, would need to have been carefully and widely spaced if large numbers of animals were killed (Steward 1938).

The size and density of the antelope herd varies in response to season. In the summer, antelope populations are dispersed because the feed range and resource abundance are great, and during this period bands of 3-60 animals exist (Simons 1973). In the winter, when available forage is more limited, the populations tend to aggregate together in localized areas, sometimes in large herds of several hundred or thousand animals (Einarsen 1948; Grinnel 1929; Simons 1973; Skinner 1923). These smaller winter ranges are often situated in flat valleys where several drainages converge (McLean 1944). It is only during the fall rut that pairs and small groups of 3-5 individuals occur (Grinnel 1929).

Black-Tailed Hare (*Lepus californianus*)

The black-tailed hare, or jackrabbit, is found throughout most of the biotic communities represented within the study area, the exceptions being the Sonoran and Transition life zones in higher elevations. Jackrabbits prefer living in semi-open environments where there is enough vegetation to provide food and shelter during noonday heat, yet enough open space to allow easy escape from predators; this latter criteria is important in view of the hare's tendency to flee danger rather than hide (Orr 1940).

Due to its great speed, the jackrabbit would be predicted to be difficult to hunt with the bow and arrow and would be more easily taken through the use of fire and net communal drives. The ethnographic record supports such a supposition (Flannery 1966, 1967; Steward 1938), with many anthropologists reporting the widespread occurrence of communal rabbit hunts. Because the jackrabbit multiplies quickly and in great numbers (Orr 1940), these drives would be continuously successful (unlike the case with pronghorn antelope mentioned above).

Audobon Cottontail (*Sylvilagus audoboni*)

The cottontail is smaller and generally more limited in numbers than the black-tailed hare. It too lives in a wide variety of habitats, ranging from dense chaparral to open desert (Orr 1940), even up into the Transition lifezone (Ingels 1965). Unlike the jackrabbit, the cottontail prefers areas where brush is very dense, due to its tendency to seek cover immediately when confronted by danger.

Because of its behavioral idiosyncrasies, the cottontail would be more difficult to hunt using communal drives, being most easily taken with the bow and arrow, snares and traps (Driver 1937; Steward 1938).

Rodents

Several different species of rodents are represented, both in the

ethnographic literature and in the archaeological record. These various forms will be discussed together since their behavior and distribution is not widely variable. The primary species under consideration are the western grey squirrel (Sciurus griseus), the Mohave ground squirrel (Citellus mohavensis), the desert woodrat (Neotoma lepida), and the Botta pocket-gopher (Thomomys bottae).

The western grey squirrel is adapted to a wide variety of habitats, it being the only tree squirrel which makes use of the Sonoran and Transition lifezones. Most of its range includes seed-producing trees, oaks being the preferred form. The squireels are principally diurnal, spending much of the day gathering seeds and/or other foods (Ingles 1965).

The Mohave ground squirrel is much less active than the grey squirrel, spending much of its time in underground burrows. The primary foods are seeds and nuts which it stores in its subterranean home.

The desert woodrat is primarily nocturnal, spending days in elaborate twighouse burrows. Because the desert woodrat prefers drier habitats than other woodrat forms, it would be most common within the sagebrush - short grass - scrub zone (Ingles 1965).

These forms, though varying in their respective degrees of nocturnal/diurnalness, are small retiring creatures for the most part. Most groups which exploited them seemingly viewed them as supplemental resources, to be taken with passive procurement techniques (i.e. snares, deadfalls, etc.), although Driver (1937) records them being run down and killed with throwing-sticks and stones. In general, rodents appear to have been taken when and where possible without undue energy/time expenditures.

Ethnographic Survey of Hunting Patterns

The following discussion of aboriginal animal use will integrate available data from the Tübatulabal, Little Lake Shoshone and Kawaiisu ethnolinguistic groups into a general model of southern Sierra Nevada animal exploitation. While it is obvious that minor differences existed between these groups, the consolidation can be done under the tenets of general cultural ecological theory as presented by Julian Steward (Steward 1955, 1976; Murphy 1970). The working assumption is that technological adaptations with respect to subsistence activities are closely tied in with the kinds and availability of resources being exploited. In the region being considered the basic animal resources were similar, when not identical, therefore we would assume exploitative strategies to be parallel. Even without direct observational data, it would seem farfetched to assume that deer or mountain sheep behavior would be drastically different in closely proximal areas, to the point of requiring very different extractive methods.

Under these guidlines the following synthetic model will be developed; however, the Tübatulabal group will be stressed for two reasons: ethnographic information is most complete for them, and the Bear Mountain archaeological sites are located within that ethnolinguistic area. The section will consider animal use in terms of hunting or direct procurement strategies and importance.

Mule Deer

Deer appear to have been an integral part of the Tübatulabal subsistence regime (Smith 1978:444; Voegelin 1938:12), while they appear to have held less importance for the Little Lake/Koso peoples (as indicated by the paucity of references to such in the literature) (Steward 1938:80-83). Voegelin (1938:11) notes that when people were gathering pinyon in early fall at higher-elevation, hunting activity was at a relatively low level. At the acorn grounds, however, later in the fall, deer were hunted extensively as they also came into the area to eat the resource. In addition to this particular period, Voegelin (1938:11) says that deer were hunted almost year-round, both in the Kern drainage and in the higher mountains.

For the Desert groups, as stated above, deer held less important; Steward (1938:83) does note that they were hunted in the Sierra upon occasion, however, in general, mountain sheep and antelope were prefered due to their more localized abundance.

Deer were hunted using the sinew-backed bow through two main techniques: stalking, and use of blinds. In stalking the animals a deer-head decoy was often utilized. The head was cleaned of flesh, brains and bone, then stuffed with grass with the horns and neck-hide still intact. The hunter placed the decoy over his head and crept up on the deer using the antlers to rattle the brush. When the curious animal approached, the hunter jumped-up and dispatched it.

Blinds were constructed of scrub-oak with a small peephole in one side. They were built along deer trails, and, as the hunter hid inside the enclosure, beaters outside would chase deer down the trails past the blinds, from where it was shot and killed.

Mountain Sheep

The notable absence of ethnographic data regarding sheep exploitation within Tübatulabal sources (Smith 1978; Voegelin 1938), with a definite stress on such procurement among Desert-oriented groups, points toward a general lack of economic importance for the taxa among the former. The sole mention of sheep procurement by Voegelin notes that they were taken with the bow and arrow, and that her informants felt them "easier to kill than deer (1938:13)." Apparently mountain sheep were not common in their territory. Tübatulabal, being for the most part Kern drainage oriented, would quite reasonably put their stress upon the deer resources in the lower elevation forest and forest-edge areas, whereas the Desert peoples, without this high quality deer-pool, would understandably look more to valley-dwelling antelope and mountain sheep in the Coso Range and eastern escarpment of the Sierra Nevada [although it also seems that the Sierra were avoided, at least to some extent, by Desert groups due to the steep and precipitous nature of the eastern scarp (Steward 1933:253). Steward (1938:33) does note that Little Lake/Koso groups traveled to the Sierra for sheep upon occasion].

In sum, it seems the Tübatulabal people had little to do with sheep procurement due to distribution of the animals, while the Desert-oriented groups put stress on the same resource.

The ethnographic record suggests three primary hunting techniques: stalking, driving past concealed hunter(s), and group ambush (Driver 1937; Heizer and Baumhoff 1962; Steward 1933, 1938). Due to their skittish nature, individual stalking was less efficient than driving or ambush; instead it was preferable to take advantage of the animal's normal shyness and tendency to flee to higher, less accessable areas (Jones 1950; Muir 1922). The ethnographies stress such procurement strategies (Grant, Baird and Pringle 1968; Heizer and Baumhoff 1962; Simons 1973; Steward 1933, 1938; Thomas 1972), and observations by Muir bear out the existence of such exploitative patterns:

> On the tops of nearly every one of the Nevada mountains that I have visited, I found small, nest like enclosures built of stones, in which, as I afterward learned, one or more Indians would lie in wait while their compansions scoured the ridges below, knowing that the alarmed sheep would surely run to the summit, and when they could be made to approach with the wind they were shot at short range (1922:320-322).

In addition to the Muir account, Grant, Baird and Pringle (1968) report the existence of "dummy hunters" of piled rocks in the Coso Range. These are interpreted as having been used in disorientating the driven sheep.

Pronghorn Antelope

While there were apparently no communal antelope drives in Tübatulabal territory (Voegelin 1938:13; Smith 1978:443), the animals were exploited by the group. Accounts suggest that the Tübatulabal traveled both to the San Joaquin and Indian Wells valleys for inter-tribal drives. Steward records drives which took place during June near Brown, in Indian Wells Valley, involving both Little Lake Shoshone and Tübatulabal (1938:81-82), and Smith and Voegelin report a similar occurrence in Yokuts territory. In July, the Tübatulabal would travel to the plains near Bakersfield and participate in antelope drives with the Kawaiisu, Tejon, Ventura, and Yokuts (Kroeber 1925:528-529; Smith 1978:443; Voegelin 1938:13).

Detailed descriptions of these communal drives exist for both Tübatulabal and Desert populations and will be summarized here. In the San Joaquin Valley as many as 500 men arranged themselves in a circle which was 2-4 miles in diameter. From this initial position the men would walk toward the center driving the antelope before them. When the circle had shrunk to a few hundred feet in diameter, ten men [Kroeber (1925:529) says this consisted of two men from each tribe] stepped into the ring and dispatched the animals with arrows (Voegelin 1938:13).

Among the Little Lake Shoshone, drives were made using corrals. Antelope were driven by 8-10 men (perhaps with the aid of fire) into a corral built of posts placed 20 feet apart and covered with brush. While the trapped animals milled-around inside the enclosure, archers hiding behind posts shot them (Steward 1938:82).

When not engaging in communal drives outside of Tübatulabal territory, the men hunted antelope by ambush; the animals were chased past a concealed hunter in a manner similar to that described for sheep. Waterman

photographed a trail leading from South Fork Valley to Kern Valley which shows loose rocks which "are remains of [a] small structure and pit, where lurking hunters shot antelope which were run through the pass with beaters (cited in Voegelin 1938:13).

These data indicate that two major hunting strategies were used in procuring antelope: the communal drive and the ambush. Furthermore, it appears that these techniques were area-specific with drives taking place in lower elevation areas where vast herds of antelope existed. Ambushing occurred in the Kern-drainage area where the animal populations were no doubt sparser.

Rabbits

As noted in the preceding section, the two kinds of rabbits (jackrabbits and cottontails) behave in non-parallel ways. For this reason different procurement strategies would seem adaptive according to particular taxa. A problem exists with the ethnographies in this regard: rarely does it seem that rabbit taxa are differentiated and discussed separately, so one must infer rabbit type from hunting methods.

It is an understatement to say that rabbits were of great import in aboriginal diets, both of the Tübatulabal and Desert groups. This importance would seem to extend both to jackrabbits and cottontails, though the latter were much less central than the former. Voegelin (1938:13) records the procurement methods which were extant among the Tübatulabal: the fire drive, wherein dry brush was set afire and 20 or more men clubbed the animals as they fled the burning brush; the net drive, in which rabbits were driven to canyon mouths where a net had been set-up, and the animals became entangled in the nets and were dispatched; and the "archery" technique, in which boys or men (either singly or in groups) shot the animals with the bow and arrow.

If the general behavioral qualities of the two rabbit forms are considered, it seems probable that the first two of these techniques applied to jackrabbits, whereas the latter one was oriented toward cottontails.

Steward (1938:38-39, 80-82) records separate procurement methods for the two forms. For the jackrabbit the common strategy was the communal drive, in which a large U-shaped net was used. The net was held erect by a mass of people and then, when others had frightened the rabbits into the enclosure, the ends were met and the animals were encircled. They were then killed with clubs, rocks or arrows. For the cottontail different extractive methods were used. Because they were more limited in numbers, and because they were difficult or impossible to take with drives, they were taken using snares or the bow and arrow.

Rodents

Rodents of various forms were exploited by both the Tübatulabal and Desert populations. They were, however, more central to the faunal diet in the latter situation due to the notable paucity of large game in desert areas (Steward 1938:33-34, 40, 83).

Among the Tübatulabal, the mammals were seemingly caught using passive techniques: through the use of rock-traps, through the use of snares, etc.

With the Desert-groups, on the other hand, rodents were more necessary to the diet and therefore warranted more attention. Rodents were dug out of their burrows with sticks, pulled from them with a rabbit "skewer," smoked out, flooded out, or killed as they left the burrow with a deadfall trap (Steward 1938:40). When encountered away from their burrows, the rodents were run down and killed with sticks and stones.

Carnivores

Carnivores were given little attention by either Tübatulabal or Desert groups. Voegelin (1938:13) does note that grizzlies and brown bears were sometimes shot in the summer; however, the animals were not actively sought out. On rare occasions mountain lions were killed, being shot and wounded on the ground and dispatched after being treed. Carnivorous animals were also avoided by Shoshone peoples. Steward (1938:34) notes that wolves, coyotes, mountain lions and bobcats were taken only with difficulty and were rarely consumed.

Fish

As is noted in Tables 48, and 49, fish played a very integral part in the Tübatulabal subsistence regime (Smith 1978:443-444; Voegelin 1938:13). Generally they were caught by individual men using basket traps, nets, bone and wood-pronged harpoons, and fishhooks. In July, however, when the rivers were low, several hamlets would engage in communal fishing. Stones and wood were placed in streams and arranged in a key-hole shape with the narrow end left open. Fish were scared into the "corral" and then thrown onto the bank and killed.

Fish were not nearly as important to the Desert-oriented groups simply because water was not plentiful. Fish were taken in Rose Valley and, using poison, in Little Lake (Steward 1938:83).

Birds

Birds, though probably never of central importance to either Tübatulabal or Little Lake/Koso subsistence regimes, were taken by both groups. Smith (1978:444) and Voegelin (1938:13) note that birds (including quail, pigeon, teal, and coot) were taken with the bow and arrow from blinds built near nesting areas and/or water holes. They were also taken with the rock trap (as noted for rodents).

With respect the Desert groups, Steward (1938:83) does note that birds were exploited (citing in particular doves, eagles, hawks and crows), but he provides no description of procurement techniques; one can assume that the bow and arrow was used.

<u>Relative Meat/Protein Value of Primary Economic Taxa</u>

It is, of course, obvious that different animal taxa are represented by differential amounts of edible meat per individual. This fact is very

important in examining the question of relative dietary importance across taxonomic lines, since the amount of food provided by an animal will play an integral role in determining the time/energy expenditure human predators will invest in procuring that game. The variable amounts of meat/protein must then be weighed carefully when developing and/or testing any model of faunal exploitation. In addition to raw meat values, both protein and caloric values vary between taxa. Ziegler (1973) notes that birds contain only 1/2 the calories per gram of meat than do mammals; fish range across this entire spectrum.

Tables 48, 50 and 51 present values for the edible meat weight represented by individual within those taxa considered as of economic importance. As can be easily seen, the artiodactyls provide the most usable meat per animal; lagomorphs are next, followed by rodents, birds and fish.

The Formal Regional Model

In formulating the following predictive model of aboriginal faunal exploitation, six major lines of data were considered: distribution and relative predicted abundance of prey taxa; seasonal availability of prey species; potential dietary importance or meat/protein value per individual animal within taxa; ethnographic details concerning exploitation of various taxa; relative procurement ease; and finally, seasonal habitation areas of aboriginal populations. Note that the model is meat for the Tübatulabal ethnolinguistic area as a whole, meaning that localized areas within the region may exhibit differences due to immediate environmental conditions.

For the general Tübatulabal area of the southern Sierra Nevada, Table 48 presents the proposed ranking of prey taxa. As can be seen, deer, fish, and jackrabbits are ranked as of high importance; antelope as medium; and cottontails, mountain sheep, rodents and birds as medium/low or low import. On the basis of this model, predictions can be made with respect to archaeological remains: if the Tübatulabal area were to be examined in its entirety, this model would predict the overall faunal assemblage to demonstrate a dietary ranking corresponding with it. As noted previously, any particular site or cluster of sites would not necessarily correlate to the model with complete accuracy. This is due to the biases caused by localized ecology; certain resources vary in abundance based upon environmental situations (e.g. fish would be of little, if any, importance in ecozones without permanent and substantial water sources).

For this reason, the specific character of the Pacific Crest Trail sites must be examined independently of the region, and unique predictions for the situation must be developed. In that the sites excavated are located solely within the pinyon-juniper macroenvironment, faunal resources would be shifted in terms of exploitation potential. For example, the sites are situated at higher elevations which are characterized by fairly rugged terrain, with little meadow/grassland area. Consequently, the area is not deemed to have been a prime antelope habitat, and this animal would be predicted to have been of minimal, or nonexistent importance. Fish as a resource would also be predicted to be lacking due to the paucity of available permanent water sources. If fish were consumed

within the project area, they were presumably "imported" from more distant locales, perhaps from the Kern-drainage proper.

At any rate, due to their own peculiar locations, the Pacific Crest Trail sites must be considered as a specialized subregion within the Tübatulabal subsistence sphere. When taking into account these unique positions, the predicted importance of prey taxa is modified; new ranking predictions are presented in Table 50.

Having developed this regional model of faunal exploitation for a limited part of California, it must be tested against the archaeological data. This testing will be presented in the data section below.

Faunal Remains and Site Function

As noted previously, this analysis has two major goals, one being the development of a regional model (presented above), the other being the examination of faunal remains in terms of site function. Within another chapter of this report (i.e. Prehistoric Land Use Patterns of Upland Pinyon Areas of the Southern Sierra Nevada) a complete subsistence-settlement site typology has been developed for the sites located along the Bear Mountain Segment. This typology identifies three subsistence-settlement types: pinyon base camps, temporary pinyon stations, and temporary hunting camps.

Faunal data will be examined with respect to the typology and correspondences and/or discrepancies noted.

Data Considerations

In quantifying the faunal remains, attention was focused on corrected bone weights and raw bone counts per taxon; tables presenting these values are Tables 52 and 53. In addition, Table 54 provides minimum number of individual values for those readers in disagreement with the author on merits of various quantification techniques.

In testing the proposition presented by the regional model (as modified for the study area), all bone recovered from both the Lamont Meadow/Morris Peak and Bear Mountain trail segments was summed using the above methods and compared with the model's predictions. Table 55 shows ranking of taxa <u>prior</u> to exclusion of non-economic forms and Table 56 presents ranking of economic taxa only excluding <u>Canis</u> and <u>Thomomys</u> which were considered noneconomic in nature (see Table 55 for discussion of this problem).

Upon viewing Table 56 the following picture emerges: the data corresponds to the model quite neatly when corrected bone weights are considered. When raw bone counts and minimum numbers of individuals are viewed, however, mountain sheep appears somewhat missplaced. If animal size and meat value are considered, the form is obviously worth more per individual than either rodents or cottontails. Comparison with the model presented in the preceding section shows a relatively close correspondence: the only taxa which are somewhat skewed are rodents and cottontails, being reversed in the two cases considered. I believe this is due to the intrusive nature of many rodent forms (e.g. <u>Neotoma</u>, <u>Citellus</u> and <u>Thomomys</u>, already excluded). In any event, both rodents and cottontails are predicted

by the model to be of relatively minor overall importance and their archaeological ranking supports such a contention.

In sum then, the archaeological data support the predictions made within the regional model to a great extent; the model can be considered demonstrated until further data is available for retesting.

In terms of the site typology, faunal remains were quantified in three ways: the number of taxa represented at a site, which provided a measure of species diversity; the number of bones per cubic meter of excavated midden; and the raw weight of bone per excavated midden. These latter values provided measures of the overall amounts of bone per site, which in turn reflects the degree of animal exploitation associated with a site. These values are presented in Tables 57, 58 and 59.

All of the quantification methods pointed out a notable dichotomy in site use/function. One site cluster, comprised of PCT-15 and -20 from the Lamont Meadow/Morris Peak trail segments as well as KR-39 and -41, contained both large amounts of bone and wide varieties of taxonomic forms. This elaboration of subsistence activities associated with animal procurement is consistent with the characteristics attributed to pinyon base camps (see chapter on Prehistoric Land Use Patterns of Upland Pinyon Areas of the Southern Sierra Nevada).

Another site cluster emerged, this one characterized by extremely low species diversity and minimal overall bone amounts. Sites PCT-16, -1, -4, -3, -18 and -21 (Lamont Meadow/Morris Peak trail segments) and KR-60 (Bear Mountain segment) are included in this cluster. These sites are categorized as temporary pinyon stations and temporary hunting stations by the general project analysis. However, it is not possible to differentiate these two forms based on bone. Sites which fall into either one of these categories based upon their total cultural inventory contain seemingly identically minimal faunal assemblages.

This problem with functional identification brings up an important point; because sites are not classified as, say, pinyon base camps (e.g. KR-57) on the basis of the faunal inventory, does not mean that they are in fact not pinyon base camps. The entire cultural assemblage, site location, etc., must be considered when assigning typological labels.

Conclusions

A model for faunal exploitation in the southern Sierra Nevada has been formulated and tested against the archaeological record. The model presented herein will hopefully provide the groundwork for further archaeological investigations, even though it is not entirely complete. Butchering practices and cooking methods, among other things, were overlooked in the present study and should be integrated into any finalized, regional encompassing model. The regional model presented in this section, which dealt primarily with dietary data, was strongly supported by the faunal remains; it can be considered corroborated for the present time. When more faunal data becomes available, it will be possible to reexamine the model in terms of a larger sample size.

Data tested against the site typology also appear to corroborate the predictions. There seem to be two major site types (as seen in the faunal assemblage), one being pinyon base camps and the other including

both temporary pinyon stations and hunting stations. Even though faunal remains cannot differentiate these two latter types, it does support the contention that little or no bone would be found associated with either.

TABLE 48. Ranking of Economic Faunal Taxa in Terms of Relative Dietary Importance for General Tübatulabal Area.

	Taxa	Distribution	Importance*	Meat Value	Season of Exploitation**
1.	Odoc. hem.	throughout the region; sparser in higher elevations along the Sierra crest.	very high	45,000 grams/ individual	year-round with possible exception of pinyon period in early Fall.
2.	Fish	Within region at locations of permanent water. Also to east and west of Sierra (e.g. Tulare Lake).	very high	1-200 grams/ individual	year-round. Greater stress in Spring-early Summer and late Summer-early Fall. Dried fish in Winter.
3.	Lepus calif.	throughout the region in zones with sufficient open space	high	1,400 grams/ individual	year-round
4.	Antilocapra	Open zones in lower elevations. Especially in valleys to east and west of Sierra.	medium	45,000 grams/ individual	Summer in adjacent valleys. Sporadically year-round.
5.	Syvilagus sp.	in thick brush/chaparral throughout the region.	medium/low	800 grams/ individual	year-round.
6.	Ovis canad.	higher elevations, rugged terrain (perhaps lower during winter.	low	45,000 grams/ individual	during summer/fall period when in higher elevation zones.
7.	Rodents	various forms throughout the region.	medium/low	150 grams/ individual	various form year-round.
8.	Birds	various forms throughout region (upland birds in brush/waterfowl near water sources.	low	3-500 grams/ individual	upland game birds during spring/summer/fall. Migratory waterfowl were seasonal.

NOTE:* Importance is measured here in view of ethnographic stress.

** Seasonal patterns are presented in Table 49.

TABLE 49. Summary of Ethnographic Data Pertaining to Seasonal Animal Exploitation (Table developed from data presented in Kroeber 1925; Smith 1978; and Voegelin 1938).

Taxa	- Winter - Spring - Summer - Fall -
Fish	- - - - - - ------------ - - ------ - - - -
Deer	------------------------------------- - - - - -----
Antelope	-------- - -[?]------------ - - - - - - -
Mtn. Sheep	[?]- - - - - - - - - - - - - - - - -
Rabbits	--
Rodents	- - - - - --
Birds	- -

*NOTE: A solid line means intensive exploitation [-----], a spaced line means sporadic exploitation [- - - -], and absence of a line means no known exploitation during that period [   ].

TABLE 50. Ranking of Economic Taxa as Modified for the Study Area.

Taxa	Meat Value	Relative Estimated Density
1. *Odoc. hem.*	45,000 grams/individual	semi-dense
2. *Lepus calif.*	1,400 grams/individual	semi-dense
3. *Ovis canad.*	45,000 grams/individual	sparse
4. *Syvilagus* sp.	800 grams/individual	dense
5. Rodents	150 grams/individual	dense
6. Birds	3-500 grams/individual	seasonally dense
7. Fish	1-200 grams/individual	non-existent
8. *Antilocapra*	45,000 grams/individual	non-existent

TABLE 51. Converstion Factors for Skeletal Weight/Edible Meat Weight Corrections (weight in grams).*

Species	Skel. Wt.	Total Wt.	% E/Total Wt.	Edible Wt.	Correction
Odoc. hem.	5443.1	90718.0	50	45359.0	8.33
Ovis can.	6622.4	90718.0	50	45359.0	6.85
Syvilagus	68.4	1587.0	50	794.0	11.61
Lepus calif.	117.3	2721.0	50	1360.0	11.60
Sciurus sp.	41.7	845.0	70	592.0	14.20
Neotoma sp.	8.4	225.0	70	158.0	18.81
Citellus sp.	5.2	114.0	70	80.0	15.40
Thomomys bott.	7.6	115.0	70	81.0	10.66
Canis sp.	748.0	11950.0	50	5975.0	7.99

*NOTE: Correction factors are obtained by dividing edible meat weights by the skeletal weights provided above. Data are drawn from: Smith 1975; White 1953; and Ziegler 1973.

Table 52. Corrected Bone Weights for Sites Located Along the Lamont Meadow/Morris Peak and Bear Mountain Trail Segments*

Lamont Meadow/Morris Peak Segments

Sites	Odoc. hem.	Ovis	Syvilagus	Lepus	Sciurus	Neotoma	Citellus	Thomomys	Canis sp.
PCT-20	768.91	78.11	3.71	99.84	20.49	11.13	1.54	34.96	243.45
PCT-1	13.33	-	-	1.51	-	1.88	-	-	-
PCT-3	-	-	-	11.02	-	-	-	-	-
PCT-4	-	-	-	.70	-	-	-	-	-
PCT-15	7.08	-	-	-	-	-	-	-	-
PCT-16	49.15	-	-	-	-	-	-	-	-
PCT-18	-	-	-	-	-	-	-	3.73	-
PCT-19	-	-	-	.58	-	-	-	-	-
PCT-21	.23	-	.23	-	-	-	-	-	-
	838.70	78.11	3.94	113.65	20.49	13.01	1.54	38.69	243.45

Bear Mountain Segment

Sites	Odoc. hem.	Ovis	Syvilagus	Lepus	Sciurus	Neotoma	Citellus	Thomomys	Canis sp.
KR-39	55.81	15.75	.93	-	1.42	-	-	-	-
KR-41	61.64	-	.81	.58	5.40	3.01	.77	13.86	-
KR-42	-	-	-	-	-	-	-	-	-
KR-60	-	-	-	-	-	-	-	-	-
	117.45	15.75	1.74	.58	6.82	3.01	.77	13.86	-

*NOTE: These are not raw values; they have been multiplied by a constant which corrects for differential edible meat weight/skeletal weight ratios between taxa (see Table 51 for correction factors).

TABLE 53. Raw Bone Counts per Species for Sites Located Along the Lamont Meadow/Morris Peak and Bear Mountain Trail Segments.

Lamont Meadow/Morris Peak Segments

Sites	Odoc. hem.	Ovis	Syvilagus	Lepus	Sciurus	Neotoma	Citellus	Thomomys	Canis
PCT-20	85	7	4	52	9	11	1	19	35
PCT-1	1	-	-	2	-	6	-	-	-
PCT-3	-	-	-	5	-	-	-	-	-
PCT-4	-	-	-	2	-	-	-	-	-
PCT-15	1	-	-	-	-	-	-	-	-
PCT-16	1	-	-	-	-	-	-	-	-
PCT-18	-	-	-	-	-	-	-	5	-
PCT-19	-	-	-	1	-	-	-	-	-
PCT-21	1	-	1	-	-	-	-	-	-
	89	7	5	62	9	17	1	24	35

Bear Mountain Segment

Sites	Odoc. hem.	Ovis	Syvilagus	Lepus	Sciurus	Neotoma	Citellus	Thomomys	Canis
KR-39	2	1	1	-	1	-	-	-	-
KR-41	2	-	2	1	4	4	1	1	-
KR-42	-	-	-	-	-	-	-	-	-
KR-60	-	-	-	-	-	-	-	-	-
	4	1	3	1	5	4	1	1	0

TABLE 54. Minimum Numbers of Individuals Represented at Sites Located Along the Lamont Meadow/Morris Peak and Bear Mountain Trail Segments.*

Lamont Meadow/Morris Peak Segments

Sites	Odoc. hem.	Ovis	Syvilagus	Lepus	Sciurus	Neotoma	Citellus	Thomomys	Canis
PCT-20	5	1	1	4	1	2	1	1	1
PCT-1	1	-	-	1	-	1	-	-	-
PCT-3	-	-	-	1	-	-	-	-	-
PCT-4	-	-	-	1	-	-	-	-	-
PCT-15	1	-	-	-	-	-	-	-	-
PCT-16	1	-	-	-	-	-	-	-	-
PCT-18	-	-	-	-	-	-	-	1	-
PCT-19	-	-	-	1	-	-	-	-	-
PCT-21	1	-	1	-	-	-	-	-	-
	9	1	2	8	1	3	1	2	1

Bear Mountain Segment

Sites	Odoc. hem.	Ovis	Syvilagus	Lepus	Sciurus	Neotoma	Citellus	Thomomys	Canis
KR-39	1	1	1	-	1	-	-	-	-
KR-41	1	-	2	1	1	1	1	1	-
	2	1	3	1	2	1	1	1	0

*NOTE: The minimum number of individuals values were derived using the entire site as the measuring unit.

TABLE 55. Relative Dietary Ranking of All Taxa as Reflected in Archaeological Remains.

	Taxa	Corrected Weight	Raw Counts	MNI
1.	*Odoc. hem.*	956.15	93	11
2.	*Canis* sp.*	243.45	35	1
3.	*Lepus calif.*	114.23	63	9
4.	Rodents**	98.19	57	12
5.	*Ovis canad.*	93.86	8	2
6.	*Syvilagus* sp.	5.68	8	5

NOTE: *The *Canis* bones are suspect as being of economic nature, they appear to be from a solitary dog burial (see Basgall and Hildebrandt 1978-9, for a more detailed discussion of *Canis* remains). They are therefore excluded from dietary rankings.

**These rodent values include the taxon *Thomomys* or pocket-gophers. These animals are great burrowers and especially frequent midden deposits due to the looseness of the soil therein. For this reason they must always be suspect in terms of economic nature. If they are removed from economic consideration, as I believe proper, the "rodent" values change and are, respectively, 45.64 grams; 37 bones; and 9 MNI's.

TABLE 56. Relative Dietary Ranking of Economic Taxa as Reflected in Archaeological Remains.

	Taxa	Corrected Weight	Raw Counts	MNI
1.	*Odoc. hem.*	956.15	93	11
2.	*Lepus calif.*	114.23	63	9
3.	*Ovis canad.*	93.86	8	2
4.	Rodents	45.64	37	9
5.	*Syvilagus* sp.	5.68	8	5

TABLE 57. Species Diversity Represented at Sites Located Along Lamont Meadow/Morris Peak and Bear Mountain Trail Segments.

Lamont Meadow/Morris Peak Segments

Sites	Number of Taxa Represented	Artiodactyls	Lagomorphs	Others
PCT-20	11	2	2	7
PCT-1	3	1	1	1
PCT-3	1	-	1	-
PCT-4	1	-	1	-
PCT-15	1	1	-	-
PCT-16	1	1	-	-
PCT-18	1	-	-	1
PCT-19	1	-	1	-
PCT-21	2	1	1	-

Bear Mountain Segment

Sites	Number of Taxa Represented	Artiodactyls	Lagomorphs	Others
KR-39	4	2	1	1
KR-41	7-8	1-2	2	4
KR-42	2	1(?)	-	1(?)
KR-60	1	1(?)	-	-

TABLE 58. Presents Both Number(s) of Bones and Weight of Bones per Cubic Meter of Excavated Midden, from Sites Located Along the Lamont Meadow/Morris Peak and Bear Mountain Trail Segments.

Lamont Meadow/Morris Peak Segments

Sites	Number Bones/Meter^3	Weight Bone/Meter^3 (grams)
PCT-20	158.7	43.8
PCT-15	37.0	8.6
PCT-16	12.6	9.1
PCT-1	12.2	1.5
PCT-4	7.5	.38
PCT-3	6.8	.93
PCT-18	5.4	.38
PCT-21	3.3	.30
PCT-19	1.5	.12

Bear Mountain Segment

Sites	Number Bones/Meter^3	Weight Bone/Meter^3 (grams)
KR-39	41.3	10.3
KR-41	111.4	14.8
KR-42	(KR-42 was not excavated -- bone is surface material)	
KR-60	5.0	.30

TABLE 59. Subsistence-Settlement Site Types/Clusters as Seen in Bone Amounts per Cubic Meter of Excavated Midden, From Sites Located Along Lamont Meadow/Morris Peak and Bear Mountain Trail Segments.

Cluster 1: Probable Pinyon Base Camps*

Sites	Number Bones/Meter^3	Weight Bone/Meter
PCT-20	158.7	43.8
KR-41	111.4	14.8
KR-39	41.3	10.3
PCT-15	37.0	8.6

Cluster 2: Probable Pinyon Stations/Temporary Hunting Camps*

Sites	Number Bones/Meter^3	Weight Bone/Meter^3
PCT-16	12.6	9.1
PCT-1	12.2	1.5
PCT-4	7.5	.38
PCT-3	6.8	.93
PCT-18	5.4	.38
KR-60	5.0	.30
PCT-21	3.3	.30
PCT-19	1.5	.12

*NOTE: These descriptive designations are not defined in terms of only faunal material but, rather, the entire corpus of data (c.f. chapter on Prehistoric Land Use Patterns of Upland Pinyon Areas of the Southern Sierra Nevada).

FLAKED STONE ANALYSIS

by

Alan Garfinkel and Robert Jobson

This section reports on the more than 72,000 flaked stone artifacts collected from the 15 sites along the Bear Mountain Segment of the Pacific Crest Trail. The functional and technological analysis of this data set is the subject for the present paper. Toward this end, the raw materials from which these artifacts were manufactured and their production/use classes are described. This is followed by a brief review of the methods available for functional and technological analysis and a statement on the procedures used for this study. The analytical results of this study are then presented. A concluding section synthesizes these analyses and attempts to correlate the activity sets inferred with previously established subsistence-settlement types.

Initial Organization of the Flaked Stone Assemblage

Flaked stone items were first organized by raw material type; the number and weight of the items for each kind of material were recorded in order to determine the degree of variation in the assemblage. Table 60 presents the amounts and weights of raw materials represented in the entire assemblage.

The types of material recovered in order of abundance are: obsidian, chalcedony, quartzite, quartz crystal, basalt, felsite and quartz. Obsidian was in the vast majority at all sites, accounting for 98.6% of the entire assemblage by number and 96.7% by weight. Chalcedony represented 1.3% of the assemblage by number and 2.3% by weight. Small amounts of the other materials were also noted. The frequencies and weights of obsidian and chalcedony for each site are presented in Tables 61 and 62.

Subsequently these raw material groups were divided into four production/use categories:

Class 1. This category includes all specimens which have been either bifacially or unifacially worked and of which the edge outlines have been significantly modified. This group includes items traditionally identified as "tools", including projectile points, drills, bifaces, retouched scrapers and core tools. It also includes examples of blanks and preforms which are usually considered to be unfinished artifact forms.

Class 2. This class of artifacts is composed of all flakes which have evidence of use-wear or edge-modification. This modification may be on one or both faces. This group consists of all simple flake tools and includes that set of items usually termed "utilized flakes."

Class 3. This group comprises all flakes having no evidence of modification or use along their edges. These flakes are the results of artifact production, thinning and various reduction procedures. These data are referred to as "waste flakes" or "debitage".

Class 4. The specimens here consist of chips and sherds (core shatter) which are commonly called cores and core fragments. They lack the diagnostic attributes of flakes and are inferred to be the remains of artifact production.

Table 60

Summary of Flaked Stone Artifacts

Number and %

1.	obsidian	71,391	98.6%
2.	chalcedony	918	1.3%
3.	quartzite	30	-
4.	quartz crystal	27	-
5.	basalt	24	-
6.	felsite	12	-
7.	quartz	10	-
	Total	72,412	

Weights in grams and %

obsidian	17,184.3	96.7%
chalcedony	583.0	2.3%

Number by class	Obsidian	Chalcedony
1	211	14
2	1,489	14
3	69,440	879
4	351	11

Weight by Class (grams)

1	424.6	65.9
2	1,903.5	20.2
3	14,374.7	413.7
4	390.4	83.0

Totals per 100 flakes

obsidian	.24
chalcedony	.30

Table 61. Numbers of Flaked Stone Artifacts by Raw Material and Site.

	Class 1		Class 2		Class 3		Class 4			
	obs	cc	obs	cc	obs	cc	obs	cc	Total	Class 1 & 2 / Class 3 & 4
KR 39	89	3	203	7	24010	631	64	1	25008	.01
41	42	1	454	-	26217	99	87	1	26901	.02
42	15	-	185	5	3661	33	33	-	3932	.05
43	5	1	26	-	433	8	3	1	477	.07
44	5	1	70	1	1600	10	12	-	1699	,05
46	6	1	51	-	1363	3	12	-	1436	.04
48	11	-	52	-	591	4	1	-	659	.10
49	1	-	67	-	1321	1	10	-	1400	.05
50	2	1	29	-	101	1	2	-	136	.31
53	2	-	67	-	583	1	1	1	655	.11
57	17	3	175	-	7458	58	15	5	7731	.03
60	3	1	17	1	199	14	2	2	239	.10
64	9	1	70	-	1782	16	9	-	1887	.04
71	2	1	18	-	117	-	-	-	138	.17
73	2	-	5	-	4	-	o	-	11	1.75
Totals	211	14	1489	14	69440	879	251	11	72309	

Table 62. Weight of Flaked Stone Artifacts by Raw Material and Site (grams).

	Class 1		Class 2		Class 3		Class 4		
	obs	cc	obs	cc	obs	cc	obs	cc	Total
KR 39	119.4	1.4	256.7	11.8	3210.3	143.2	52.7	9.7	3805.2
41	44.3	2.0	573.8	-	3539.4	33.7	71.5	5.6	4270.3
42	34.2	-	244.2	4.7	1720.7	56.6	82.3	-	2142.7
43	19.9	-	32.8	-	220.9	29.2	5.8	22.2	330.8
44	29.3	-	88.5	2.4	949.7	6.2	58.5	28.6	1163.2
46	35.2	-	65.7	-	578.4	1.0	60.3	-	740.6
48	30.0	-	67.6	-	301.7	15.4	2.4	-	417.1
49	.6	-	84.7	-	553.1	.3	23.7	-	662.4
50	4.6	-	36.5	-	73.5	.1	8.7	-	123.4
53	2.8	-	86.0	-	547.9	2.5	2.7	-	641.9
57	43.3	.2	220.0	-	2063.8	64.6	53.7	39.3	2484.9
60	8.0	2.5	22.7	1.3	98.3	58.1	18.7	6.2	215.8
64	30.9	1.8	89.4	-	406.0	2.8	42.5	-	573.4
71	10.5	-	27.5	-	103.0	-	-	29.6	170.6
73	9.6	-	7.4	-	8.0	-	-	-	25.0
Totals	422.6	7.9	1903.5	20.2	14374.7	413.7	483.5	141.2	17767.3

Classes 1 and 2 are the tools while Classes 3 and 4 are the by-products of tool production and maintenance.

Methods of Functional and Technological Analysis

Functional Considerations

Interest in the functional analysis of stone tools has increased dramatically since 1964 when Semenov published his now classic text on wear pattern analysis in the United States. As a result of this stimulation, there have been numerous publications covering a variety of studies, including many which have emphasized the role of replicative experiments (Newcomer 1971; Crabtree 1973; Kelley 1974; Tringham et al 1974; Brose 1975; Odell 1975; Wylie 1975; Keeley and Newcomer 1977; Noble 1978; Walker 1978; and Hayden 1979) and other studies which have included ethnographic data (Gould et al 1971; White and Thomas 1972). It has become clear through these studies that not only are tools selected or modified to fit the particular activity in which they will be used, but also that many times these tools will bear evidence in the form of macro- and microscopic marks which are the traces of this work.

The factors which create wear patterns - edge damage - are complex and inter-related. The production edge angle, the angle formed at the working edge by the juncture of surfaces, is a measure of the strength of that edge: the larger the angle, the greater the strength of the edge. Tringham and her associates (1974:188) indicate that, when applied with equal force to the same material, tools with a greater edge angle will be affected less than those with a more acute angle, and it will take longer for a damage pattern to be manifested on an edge of greater angle. Differences in edge angles, when used in the same circumstances, result in differences of degree of damage rather than in the type of damage.

The mechanical damage pattern is a valuable variable by which use may be inferred since specific tasks result in basically different modes of wear (Tringham et al 1974:189; Singer and Gibson 1970). Tringham suggests that cutting modes will generally result in bifacial wear, scraping will exhibit unifacial damage while drilling activity will leave evidence of rotary damage.

The intensity of damage found for a particular edge would indicate both the kind of material worked and the duration or intensity of this operation.

The type of damage scars is indicative of the kind of material worked and is apparent in the flake termination on both macroscopic and microscopic levels. Feathered terminations are associated with softer material and stepped-hinged fractures are associated with harder materials. Tringham et al (1974) identified nibbling use wear when specimens were employed in activities associated with animal skin, flesh and soft vegetal fiber. Scalar scars with step scarring were produced by work on fresh and seasoned woods, and pronounced step scarring was found when items were used on bone or antler. Another replicative study using obsidian has largely verified these determinations (Noble 1978).

It is important then to keep in mind that edge morphology, mechanical application, forces applied, length of application of the tool to a task, and materials worked all influence the configuration of the observed

damage. A caveat should be issued here in regard to several factors which may affect the validity of use-wear determinations. It is difficult to discern technological from functional damage patterns and, in some cases platform preparation can be misidentified as use-wear (cf. Sheets 1973). It is also probable that some tool uses leave no observable or recognizable wear patterns, and, if this is the case, certain "tools" will not be identified (Brose 1975). Furthermore, the total range of activities for which stone tools were used is certainly greater than the classes of wear usually delineated (Philipson and Philipson 1970: 55). It would be naive to think at this stage of sophistication in functional lithic analysis that our use determinations are anything more than well-founded estimations.

Technological Considerations

The production of a stone tool can be seen as a reductive process. To describe the process, it has generally been found convenient to consider it as a series of steps or stages. This trajectory of stages is a kind of linear progression whereby an objective piece is systematically reduced to form a flaked stone tool (Collins 1975:16; Bradley 1975). Description of the thinning stage combines a number of observations including the number, size, and pattern of flake scars on both faces of a specimen and of the gross morphology of an item. (More detailed descriptions of the thinning stage criteria used in the present analysis is provided under the heading "Procedure").

Morphological attributes of unmodified flaked stone can be used to illuminate certain inferences regarding tool manufacturing procedures and the character of lithic reduction at a site. It has been determined through several studies that the initial stages of tool manufacture, primary reduction which includes striking flakes from cores or roughouts will yield much larger waste flakes than subsequent stages of lithic reduction (Knudson 1975; Phagan 1976; Newcomer 1971). Further, it has been concluded that secondary reduction and shaping/finishing operations result in significantly smaller waste flakes. It can be suggested then that sites which contain many fairly large flakes and fewer smaller pieces of debitage were the loci for the more preliminary stages of tool production or primary reduction. Sites which display a range of flake sizes would represent a diverse set of reduction activities from primary thinning to the final stages of shaping and finishing. Lastly, areas which exhibit only small flakes are probably locations for finishing, retouching and resharpening activities (see Garfinkel and Cook 1979:27-34).

Analytical Procedures

The present study follows in a modified fashion a general procedure developed by Knudson (1973, 1975) and applied advantageously by Cynthia Adams (1979) in the southern Sierra Nevada. A total of nine morphological, production and use-related attributes were identified for each flaked stone tool (Classes 1 and 2). These attributes are described in detail in Appendix 5. A more generalized discussion of these features is presented here.

Use-related attributes were recorded for items of Class 1 and 2. Knudson's concept to the 'employable unit' or EU was used at this stage of analysis. The 'EU' is "that segment or portion of an implement that would provide a continuous work surface without reorienting the entire implement, when that implement is used against another material to perform work" (Knudson 1975:14). Each tool specimen may then present more than one EU. The following attributes were recorded for each EU: production edge angle, mechanical damage, intensity of damage, and type of use-related flake termination or damage scars. Examination of most attributes was conducted solely with the aid of slight magnification (10X), and only a few examples were observed under a microscope.

Types of implement functions were developed using three of the variables discussed above: mechanical damage pattern, type of damage pattern and intensity of damage. Production edge angle, while important in the assessment of the other variables, was not considered to be a primary indicator of function.

Three major functional categories, each with four subtypes, emerged in this analysis so that we have the 12 functional EU types as follows:

1. Cutting

Soft Material. Mechanical damage pattern is bilateral; termination is feathered; intensity varies from irregularly scattered scars to touching or slightly overlapping. Functional correlates for such damage patterns include cutting of animal skin and flesh and vegetal material.

Medium Material. Damage pattern is bilateral; termination is mostly feathered with some hinging or step-scarring; intensity varies from irregularly scattered scars to light crushing. Functional correlates are cutting operation of soft and fresh woods.

Hard Material. Bilateral damage pattern; termination is mostly hinged or stepped scars with a small amount of feathering; intensity varies depending on the length of use. Inferred functional correlates are cutting operations on hard and seasoned woods (Keller 1966:509).

Very Hard Material. Pattern of damage is again bilateral; termination is completely hinged or step-scarred with massive damage and non-discernable flake orientation. Hypothesized functional correlates include use on bone and antler.

2. Scraping

Soft Material. Unilateral damage pattern; termination is generally feathered, intensity is varying from irregularly scattered scars to those that touch or slightly overlap. Inferred uses are scraping of animal skins, meat and plant matter.

Medium Material. Damage pattern is unilateral; termination is in the main feathered with some step-scarring or hinge fracture; intensity varies from irregularly scattered scars to light crushing. Functional correlates include scraping of unseasoned and soft woods.

Hard Material. Mechanical damage is unilateral; termination is predominantly hinge or stepped scars with infrequent feathering; various intensities apparently dependent on length of use. Presumed functional correlates include scraping operations on dry/seasoned and hard woods.

Very Hard Material. Pattern of damage is unilateral; termination is entirely hinged or step-scarred; damage intensity is massive with

extensive over-lapping of scars and heavy crushing. Functional correlates include scraping of bone and antler.

3. Drilling

Rotary damage is found with damage termination and intensity varying along the lines previously identified for cutting and scraping operations and falls into the same four classes of work on soft, medium, hard and very hard material. There is a lack of experimental data and information concerning the damage patterns which would occur on drilling type EUs. Consequently this category and its divisions are tentative but would include functional correlates of penetration or boring of animal skin and flesh, all types of woods, plant matter, bone, stone and antler.

Production stage attributes were recorded for all Class 1 artifacts in complete enough condition to allow classification. Four rough production stages were recognized: edged pieces which still possess post detachment natural form (Stage 1) more commonly called blanks; secondarily thinned pieces having "lost" their natural form (Stage 2) or "preforms"; pieces with significant edge regularity or stylized-shaped specimens (Stage 3); and highly-formalized finished specimens (Stage 4) (see Appendix 5).

As previously stated, gross morphological characteristics of unmodified flakes (Class 3), such as relative flake size, can be used to illuminate certain inferences regarding tool manufacturing procedures and the character of lithic reduction at a site. Flake size classes were delineated through a separation technique involving a series of nested screens. Four size classes were determined: (A) flakes greater than or equal to one square inch (25.4 mm^2); (B) those smaller than one square inch but equal to or larger than 1/2 square inch (12.7 mm^2); (C) specimens less than 1/2 square inch but greater than or equal to 1/4 square inch (6.3 mm^2); and (D) those smaller than 1/4 square inch. This method proved quite rapid and quite accurate in discriminating flake size. Upon delineating flake size each group was weighed and those weights converted into relative percentages for each site.

It must be noted here that this method, although direct and practical, is certainly unsophisticated and does not account for several biasing agents. First, this method ignores the more direct measurements available for such attributes as flake length, platform angle, percussion bulb size and thickness. Although these attributes would certainly aid as measures to interpret technological processes, they are time consuming and not cost-effective. Such detailed analysis was not possible given the circumstances of the present study. Secondly, it is probable that many debitage fragments have been damaged or broken by various processes which affect the surface material found at archaeological sites such as human, animal, and motor vehicle disturbances. Hence, it is probable that there is a certain skewing of the data toward the smaller size ranges in some cases.

As a final note, twelve extremely large and roughly-made core tools were recovered from a single site; KR-39. Due to their unique character they have been described and analyzed separately from the rest of the Class 1 assemblage. A further discussion of these artifacts is contained in the following section.

Results of Analysis

Class 1 Flaked Stone Tools

A total of 226 flaked stone items were classified as Class 1 artifacts. Thirty-seven additional items were classified as typable projectile points which technically fall under the Class 1 heading but have been analyzed under the section entitled "Chronometrics". Unclassifiable projectile point fragments have been included in this Class 1 artifact analysis. Fifteen percent of all flaked stone implements were identified as Class 1. The majority of these items (211) were manufactured from obsidian and the remainder were either composed of chalcedony (14) or basalt (1).

The production angles for all measurable Class 1 items (128) have been tallied by 10° interval and by site and are available for inspection in Table 63. The range of angle classes is less than that for Class 2's, but the mean angle size is significantly larger. This suggests that formalized tools were intended for a more limited range of activities than modified flakes and were manufactured for different purposes than the flakes. The trend toward steeper production angles would indicate that these tools were designed for high stress activities necessitating the more obtuse angles and that they were more subject to maintenance/resharpening.

There were 51 Class 1 artifacts (55 EUs) which exhibited edge damage and were analyzed functionally. The inferred functions of these edge damaged specimens are tabulated in Table 69. The distribution of functional correlates for these formalized tools reaffirms some of the interpretations made through the analysis of production angles: a more limited range of inferred activities is found for the assemblage of formalized tools than for that of the modified flakes. Also, a surprising abundance of tools inferred to have been used in cutting activities dominate the assemblage. Perhaps cutting tools used for heavier work on wood, bone and antler necessitate sturdy, long lasting, steeper angled tools. The ethnographic information available reaffirms the importance of stone knives for a variety of cutting operations (Voegelin 1938).

All Class 1 artifacts complete enough for classification (167) were identified as to a production stage (Table 65) (see Appendix 5 and "Analytical Procedures" of this section). It can be discerned from inspection of Table 65 that most Class 1's fell into the final production stage - finished specimens. This is paradoxical since independent technological evidence suggests that earlier stages involving primary and secondary reduction were undoubtedly taking place at some sites (see discussion of Class 3 analysis this section).

Why these production stages are not well represented in the assemblage may reflect the relative difficulty of the Tübatulabal in procuring obsidian. In this regard, the source location of almost all obsidian recovered from the Bear Mountain Segment is from the Coso source which lies 25-30 km east in the Mojave Desert. Ethnographic information (Voegelin 1938) indicates that the Tübatulabal acquired their obsidian directly from this source. Thus, in the procurement of this resource, the Tübatulabal would have had to scale the crest of the Sierra Nevada and venture into territory not considered their own. Such a circumstance

Table 63. Frequency of Production Angle Classes by Site for Class 1.

	Production Angle (degrees)									
Site	10-19	20-29	30-39	40-49	50-59	60-69	70-79	$\overline{X}$	σ^2	Totals
KR-39	-	9	19	11	7	1	1	39.8	11.5	48
KR-41	2	3	1	2	3	1	-	38.3	17.2	12
KR-42	-	-	4	2	-	-	-	38.3	5.2	6
KR-43	-	2	2	-	1	-	-	35.0	12.2	5
KR-44	-	-	1	4	1	-	-	45.0	6.3	6
KR-46	1	1	-	3	2	-	-	40.7	15.1	7
KR-48	-	-	2	2	4	-	-	47.5	8.9	8
KR-49	-	-	1	-	-	-	-	35.0	0	1
KR-50	-	-	1	-	2	-	-	48.3	11.5	3
KR-53	-	-	1	-	1	-	-	45.0	14.1	2
KR-57	-	-	3	11	3	-	-	45.0	6.1	17
KR-60	-	-	-	1	1	-	-	50.0	7.1	2
KR-64	-	1	2	3	-	-	-	38.3	8.2	6
KR-71	-	-	-	1	2	-	-	51.6	5.8	3
KR-73	-	-	2	-	-	-	-	35.0	0	2
Total	3	16	39	40	27	2	1			128

$\overline{X}$ = 41.4°

$\overline{X}$ Range = 35.0-51.6

Table 64

Functional Correlates for Class 1 Artifact EUs

	Cut	Scrape	Drill	Total
Soft	0	0	0	0
Medium	12	6	1	19 (34.5%)
Hard	12	13	0	25 (45.4%)
Very Hard	8	3	0	11 (20.0%)
Totals	32 (58.1%)	22 (40.0%)	1 (1.8%)	55

Table 65

Numbers of Uniface/Biface Items Exhibiting Various Production Stages

	Stage 1	Stage 2	Stage 3	Stage 4
KR 39	-	-	1	56
41	-	1	2	29
42	1	-	1	10
43	-	-	-	6
44	-	-	-	5
46	-	-	-	4
48	-	-	1	9
49	-	-	-	-
50	-	-	-	3
53	-	-	-	2
57	-	-	-	19
60	-	-	-	4
64	-	-	-	7
71	-	-	1	3
73	-	-	-	2
	1	1	6	159

would have put a premium on the efficient use of obsidian which, in turn, would have mitigated against the casual discarding or loss of tools in the process of manufacture (e.g. blanks, preforms, etc.). Certainly much more research is necessary in order to further substantiate this hypothesis.

Core tools

Twelve items, all recovered from the excavations at KR-39, have been identified as core tools. They are large and heavy and are all steep angled items, most having production angles over 65° (Table 66). Nine specimens are manufactured of felsite, and the remaining examples are of milky quartz (2) and quartzite (1).

These tools are quite similar in form and may well be considered as a morphological type (see Kowta 1969). All but two bear traces of unifacial wear and, in all cases, edge damage is in the form of step and/or hinge fractures. Examples range in damage intensities from heavy to only moderate. It is significant to note that no flakes of felsite were retrieved from the excavation of KR-39. It is likely that these are tools which were manufactured off the site and that they are not simply exhausted cores exhibiting technological damage.

These core tools may have been used for heavy chopping, pounding, or shredding activities. Perhaps they were used to process the pulp of the _Nolina parreyi_ or _Yucca_ spp. These plants could have been processed on a metate, and replicative experiments indicate significant similarities in damage pattern and morphology for tools useful in the processing of plants of this sort (Hester and Heizer 1972).

Class 2 Modified Flakes

Eighty-five percent of all flaked stone tools recovered were modified flakes or Class 2 items. These stone implements numbered 1,503 with 1772 EU's. Again the majority of these specimens were manufactured of obsidian (1489), and a small minority were of chalcedony (14). The production angles of these Class 2 items are found in Table 67, grouped by 10° interval and site. The angles range from 10° to 99°, with a mean value of 28.5°. This range is larger than that of the Class 1 assemblage, and the mean value is significantly smaller. This indicates a greater variety of uses for modified flakes as manifest in the wider range of production angle. Yet, the smaller mean production angle for this Class 2 assemblage suggests the opportunistic use of these tools resulting in less durable forms not usually subject to maintenance or resharpening (c.f. Tringham 1974).

Not surprisingly, a wide variety of use modes (12) are manifest in the Class 2 assemblage (Table 68). This contrasts with the narrower range of use-modes (7) encountered in the Class 1 assemblage. In addition, scraping activities clearly dominate accounting for 87.6% of the use-modes identified on modified flakes.

Table 66

Characteristics of Core Tools From KR-39

Catalogue No.		Production Angle	Dimensions (cm) L.	W.	Th.	Wt. (gm)	*Mechanical Damage	**Type of Damage	Material
39-365	A	60-65	13.4	8.1	6.2	572.2	S	U	Felsite
39-194	B	70-75	6.9	6.1	2.0	149.6	S	U	Quartz
39-762	C	75-80	8.0	7.2	4.1	340.0	S	U	Quartz
39-226	D	100-110	7.6	6.2	6.1	297.7	S	U	Quartzite
39-860	E	70-75	8.2	5.7	3.2	148.4	S	U	Felsite
39-364	F	60-65	8.5	7.9	3.5	392.0	S	B	Felsite
39-734	G	65-75	11.8	4.4	5.9	289.8	S	U	Felsite
39-224	H	75-80	13.6	6.5	6.3	849.2	S	U	Felsite
39-227	I	50-55	6.0	4.9	2.2	49.2	H/S	B	Felsite
39-225	J	35-40	10.8	4.1	2.2	80.4	H	U	Felsite
39-628	K	35-40	7.3	5.2	3.0	93.4	H	U	Felsite

*S = Step fracture
H = Hinge fracture

**U = Unifacial
B = Bifacial

Table 67. Frequency of Production Angle Classes by Site for Class 2.

	Production Angle (degrees)										
Site	10-	20-	30-	40-	50-	60-	70-	80-	90-	$\overline{X}$	σ^2
KR-39	76	73	39	13	7	14	2	1	1	29.0	15.7
41	100	306	82	34	5	2	5	-	-	26.8	9.7
42	59	98	45	21	5	2	3	-	-	27.8	11.8
43	8	13	5	3	1	2	-	-	-	29.3	13.9
44	24	28	17	9	2	6	-	-	-	29.7	14.2
46	20	22	7	5	2	6	-	-	-	29.3	15.6
48	9	24	11	8	3	3	-	-	-	31.6	13.2
49	14	28	17	12	3	3	-	-	-	31.2	12.7
50	6	13	8	5	7	-	1	-	-	34.5	14.8
53	23	29	19	5	3	-	-	-	-	26.9	10.5
57	28	106	47	24	5	5	-	-	-	30.6	13.1
60	10	10	5	1	-	1	-	-	-	25.4	11.6
64	22	34	22	6	4	1	1	-	1	29.4	14.0
71	6	9	4	2	2	-	-	-	-	28.5	12.3
73	2	1	2	-	-	-	-	-	-	25.0	10.0
Total	407	794	330	149	51	45	12	1	2	28.5	

$\overline{X}$ Range by site = 25.0-34.5

$\overline{X}$ = 28.5

Table 68

Functional Correlates for Class 2 Artifact EUs

	Cut	Scrape	Drill	Total
Soft	49	707	5	761 (42.9%)
Medium	97	676	19	792 (44.7%)
Hard	35	159	4	198 (11.2%)
Very Hard	9	11	1	21 (11.8%)
Totals	190 (10.7%)	1553 (87.6%)	29 (1.6%)	1772

Class 3 Unmodified Flakes

Waste material, the product of tool production and resharpening, comprised some 87% of the total flaked stone assemblage by weight and 97% by number. It is surely the most ubiquitous category of flaked stone data at most archaeological sites and one which usually receives the least attention.

Variability in the relative amounts and sizes of debitage at the archaeological sites under study is most evident through an analysis of the surface flaked stone assemblage (only seven sites yielded significant amounts of subsurface flaked stone).

The results of the analysis of unmodified flakes is contained in Table 69 . These results are more fully discussed in the following Synthesis and Interpretation.

Synthesis and Interpretation

In another section of this report (Prehistoric Land Use Patterns of Upland Pinyon Areas of the Southern Sierra Nevada), all sites have been classified as to subsistence-settlement type. These site types include: pinyon base camps, temporary hunting camps, and temporary pinyon stations. These site types may be examined with reference to the data available on the functions of flaked stone tools found at these categories of sites.

Three sites (KR-39, -41, and -57) have been classified as pinyon base camps where habitation is relatively long term and activities may be expected to encompass a broad range. It is suggested that these sites were the major loci of flaked stone tool manufacture. This contention is most succinctly exhibited in the ratio of tools to debitage (Table 61). This ratio was found to be lowest ($\bar{X}$ = .02) at the pinyon basecamps. Smaller ratios of tools/debitage indicate a greater intensity of tool production and maintenance activities because these activities would result in the production of numerous waste flakes, the byproducts of biface reduction resharpening, etc. Not surprisingly, these sites possess tremendous quantities of debitage, and a relatively greater percent of this material (by weight) is of a smaller size (size categories C and D in Table 69). Thus, while all aspects of the reduction sequence were occurring at pinyon base camps, particular emphasis may have been attached to the fine finishing and resharpening of tools.

A list of functional correlates for all Class 1 and 2 items has been tabulated by site, task, and material and is available for inspection in Table 70. KR-39 and -41 have the largest number of inferred functional correlates, ten and eleven respectively, while KR-57 contains eight. All three types of mechanical damage (cutting, scraping, and drilling) were recorded at these pinyon base camps. A full range of materials are inferred to have been processed based on a wide variety of use-related flake termination and damage intensities. These data are consistent with the fact that pinyon base camps functioned as centers for hunting and gathering activities, as well as habitation areas for large population aggregates for periods of several months.

Six sites (KR-42, -44, -46, -60, -64, and -73) were inferred to have functioned as temporary pinyon stations and six sites (KR-43, -48,

Table 69. Size Classes for Surface Class 3 Flaked Stone Artifacts by Weight (grams) and Percent.

	Size Category (mm)							
	A >25.4		B <25.4-12.7		C <12.7-6.3		D <6.3	
	Wt.	%	Wt.	%	Wt.	%	Wt.	%
KR 39	24.9	9.0	56.5	20.5	176.4	63.9	18.5	6.7
41	-	-	57.4	10.6	398.5	73.6	85.6	15.8
42	115.2	6.7	487.0	28.3	998.0	58.0	120.5	7.0
43	37.4	18.7	91.8	45.9	66.8	33.4	4.1	2.0
44	232.2	25.6	343.2	38.0	301.6	33.4	26.2	2.9
46	105.8	21.1	226.6	45.2	161.5	32.2	7.5	1.5
48	-	-	15.7	5.2	262.5	87.0	23.5	7.8
49	-	-	175.3	31.7	325.8	58.9	52.0	9.4
50	14.8	20.2	32.5	44.2	24.0	32.6	2.2	3.0
53	115.6	21.1	263.5	48.1	162.3	29.7	6.1	1.0
57	27.3	1.5	555.2	30.5	1092.2	60.0	145.6	8.0
60	38.4	39.0	24.1	24.5	28.9	29.5	6.9	7.0
64	46.6	18.0	86.6	33.8	109.7	42.8	13.3	5.2
71	12.6	12.3	51.4	49.9	36.9	35.5	2.1	2.0
73	5.5	68.6	.7	8.4	1.8	1.8	-	-

-49, -50, -53, and -71) were classified as temporary hunting stations. These more temporary task-activity sites were occupied by small social groups for only several weeks or, in some cases, only several days out of the year.

Temporary pinyon station and hunting camps exhibit extremely large ratios of tools to debitage ($\bar{X}$ = .056 and .135, respectively) (Table 61). In addition, these temporary sites generally contain relatively greater amounts, by weight percent, of the larger categories of debitage (Categories A and B in Table 69). It is suggested that portable units of stone were taken on hunting and pinyon excursions and thinned only as the need arised to produce flakes for various tasks. These tools were apparently not subject to maintenance and resharpening and may have been somewhat expendable.

Not surprisingly, both of these subsistence-settlement site types exhibited a constricted range of functional correlates in relation to the flaked stone tools at pinyon base camps (Table 70). Functional correlates apparent at temporary pinyon stations ranged from 4 to 9, while at temporary hunting camps this range was from 5 to 8. This would appear to support the contention that these sites were occupied only sporadically and that only a limited range of subsistence and maintenance activities occurred at them.

Table 70

Functional Correlates by Site For Class 1 and 2 Artifacts

KR 39	Drill	Scrape	Cut	Total
Soft	3	107	7	117 (46.6%)
Medium	2	82	15	99 (39.4%)
Hard	-	14	8	22 (8.7%)
Very hard	-	3	10	13 (5.1%)
Total	5 (1.9%)	206 (82.0%)	40 (15.9%)	251

KR 41	Drill	Scrape	Cut	Total
Soft	-	214	13	227 (41.6%)
Medium	10	201	28	239 (43.8%)
Hard	1	55	13	69 (12.7%)
Very hard	1	6	3	10 (1.8%)
Total	12 (2.2%)	476 (87.3%)	57 (10.4%)	545

KR 42	Drill	Scrape	Cut	Total
Soft	-	88	1	89 (37.7%)
Medium	1	101	10	112 (47.9%)
Hard	1	23	6	30 (12.7%)
Very Hard	-	2	2	4 (1.6%)
Total	3 (1.3%)	214 (90.7%)	19 (8.0%)	235

KR 43	Drill	Scrape	Cut	Total
Soft	-	17	4	21 (60.0%)
Medium	-	6	6	12 (34.2%)
Hard	-	1	1	2 (5.7%)
Very Hard	-	-	-	-
Total	-	24 (68.6%)	11 (31.4%)	35

KR 44	Drill	Scrape	Cut	Total
Soft	-	32	2	34 (39.1%)
Medium	1	33	6	40 (46.0%)
Hard	-	9	4	13 (15.0%)
Very Hard	-	-	-	-
Total	1 (1.1%)	74 (85.0%)	12 (13.8%)	87

Table 70 (continued)

KR 46	Drill	Scrape	Cut	Total
Soft	-	22	5	27 (41.5%)
Medium	1	24	5	30 (46.1%)
Hard	1	5	2	8 (12.3%)
Very hard	-	-	-	-
Total	2 (3.1%)	51 (78.5%)	12 (18.5%)	65

KR 48	Drill	Scrape	Cut	Total
Soft	-	26	2	28 (45.9%)
Medium	-	23	2	25 (41.0%)
Hard	1	6	1	8 (13.1%)
Very hard	-	-	-	-
Total	1 (1.6%)	55 (90.2%)	5 (8.2%)	61

KR 49	Drill	Scrape	Cut	Total
Soft	-	12	3	15 (20.0%)
Medium	2	35	8	45 (60.0%)
Hard	-	11	4	15 (20.0%)
Very hard	-	-	-	-
Total	2 (2.7%)	58 (77.3%)	15 (20.0%)	75

KR 50	Drill	Scrape	Cut	Total
Soft	-	11	1	12 (30.0%)
Medium	1	15	3	19 (47.5%)
Hard	-	6	2	8 (20.0%)
Very hard	-	-	1	1 (2.5%)
Total	1 (2.5%)	32 (80.0%)	7 (17.5%)	40

KR 53	Drill	Scrape	Cut	Total
Soft	-	43	1	44 (54.3%)
Medium	-	27	1	28 (34.6%)
Hard	-	7	2	9 (11.1%)
Very hard	-	-	-	-
Total	-	77 (95.1%)	4 (4.9%)	81

Table 70 (continued)

KR 57	Drill	Scrape	Cut	Total
Soft	2	76	1	79 (36.0%)
Medium	-	93	11	104 (47.5%)
Hard	-	32	2	34 (15.5%)
Very hard	-	12	-	1 (1.0%)
Total	2 (1.0%)	213 (92.7%)	14 (6.3%)	229

KR 60	Drill	Scrape	Cut	Total
Soft	-	11	1	12 (42.8%)
Medium	-	10	5	15 (53.6%)
Hard	-	-	1	1 (3.6%)
Very hard	-	-	-	-
Total	-	21 (75.0%)	7 (25.0%)	28

KR 64	Drill	Scrape	Cut	Total
Soft	-	36	3	39 (46.4%)
Medium	-	35	3	38 (45.2%)
Hard	-	4	2	6 (7.1%)
Very hard	-	-	1	1 (1.1%)
Total	-	75 (89.3%)	9 (10.7%)	84

KR 71	Drill	Scrape	Cut	Total
Soft	-	11	4	15 (60.0%)
Medium	-	4	5	9 (36.0%)
Hard	-	1	-	1 (4.0%)
Very hard	-	-	-	-
Total	-	16 (64.0%)	9 (36.0%)	25

KR 73	Drill	Scrape	Cut	Total
Soft	-	2	1	3 (60.0%)
Medium	-	1	1	2 (40.0%)
Hard	-	-	-	-
Very hard	-	-	-	-
Total	-	3 (60.0%)	2 (40.0%)	5

EVALUATIONS OF CULTURAL RESOURCES AND MANAGEMENT RECOMMENDATIONS

In accordance with relevant Federal legislation, the Bureau of Land Management (BLM) has instituted this current contract pertaining to the 15 archaeological sites located along the Bear Mountain Segment of the Pacific Crest Trail in an effort to ascertain site significance. The government has concluded that these 15 sites are particularly vulnerable to adverse impacts resulting from trail use. These evaluations of significance will then be used by the BLM in requesting Determinations of Eligibility to the National Register of Historic Places and other management considerations.

This section of the report will assess the significance of the sites investigated along the Bear Mountain Segment, outline the potential adverse impacts that threaten these sites, and suggest a program of resource management involving the preservation and protection of these sites.

Significance

The significance of a cultural resource can only be interpreted relative to some frame of reference or criteria (Schiffer and Gumerman 1977). At the same time there exists no universal set of significance criteria that can be applied to all cultural resources. In fact, conservation archaeologists as well as government bureaucrats have exhibited a fair amount of confusion over just what criteria should be used to evaluate the significance of a resource. These problems notwithstanding, it is necessary for the archaeologist and society as a whole to engage in the process of identifying the necessary criteria in the attempt to assign significance to a given cultural resource. In the following section, the authors will discuss the significance of the cultural resources contained along the Bear Mountain using three differing sets of criteria. These criteria involve scientific, ethnic, and social considerations.

Scientific Significance

"A site or resource is said to be scientifically significant when its further study may be expected to help answer current research questions. That is, scientific significance is defined as research potential" (Schiffer and Gumerman 1977:241). Only one other systematic archaeological investigation has been conducted in this area of the southern Sierra Nevada, that being the work conducted by Garfinkel et al (1979). Together with this current research effort, these reports have established a regional research potential encompassing a variety of testable hypotheses. In general terms this research potential involves: (1) the nature and antiquity of pinyon exploitation in the southern Sierra Nevada, (2) the ethnolinguistic affiliation of sites located in the vicinity of the Kern River drainage, and (3) prehistoric land use patterns of upland pinyon areas of the southern Sierra Nevada. All sites investigated along the Bear Mountain Segment have demonstrated their potential for supplying the necessary data base to address the considerations above. It can only be concluded that the remaining cultural constituents not excavated or collected from

these sites would provide additional data that would clarify the above research questions.

At the same time, there are a number of other research questions not addressed in this report that could potentially be tested from sites such as those located along the Bear Mountain Segment. The nature of prehistoric trans-Sierran exchange of trade items between California and Great Basin groups has received recent attention (see Busby et al. 1979 for an overview of this subject). The abundant trade items such as obsidian, shell and stone beads, etc., recorded for these sites may be able to shed further light on this subject.

A study of intrasite relationships, especially at the large and complex pinyon base camps, may reveal certain elements of prehistoric social and demographic structure.

Another potentially productive research area may involve further consideration of the functional attributes and technological processes involved in flaked stone tool manufacture. Although preliminarily discussed in this report, the sheer quantity of flaked stone obsidian at sites within this area would suggest that further investigations along these lines would be particularly productive.

While the research significance discussed in the preceeding pages is pertinent to the entire study area, it is also realized that there exists marked differences in potentially recoverable data from site to site. These differences in potentially recoverable data should also be considered when evaluating a given site's scientific significance.

For instance, the large pinyon base camps (KR-39, -41, and -57) with substantial middens are relatively rare in comparison to other site types, yet they contain the widest diversity and quantity of artifactual and ecofactual constituents. In contrast, temporary pinyon stations (KR-42, -44, -46, -60, -64 and -73) and temporary hunting camps (KR-43, -48, -49, -50, -53 and -71) are much more ubiquitous and contain a narrower range of cultural constituents concommitant with their inferred task-specific nature. This topic will be returned to when considering management recommendations for each site located along the Bear Mountain Segment.

Ethnic Significance

According to Moratto (1977), "An archaeological entity which has religious, mythological, social or other special importance for a discrete population is said to have ethnic significance." Personal discussions with the Native American community in the Kern River Valley coupled with our own research findings indicate that, in general terms, using the criteria stated above the archaeological sites located along the Bear Mountain Segment do possess ethnic significance.

The present research effort has tentatively concluded that the ancestors of the Tübatulabal ethnolinguistic group have inhabited the study area for at least 2500 years. Thus, the prehistoric remains, as well as the lands they are situated on, are manifestations of a direct and unbroken line of cultural heritage that belongs to many members of the Native American community of the Kern River Valley. This same community is now in the process of petitioning the Federal Government for recognition as a "legal" and distinct Native American cultural entity. We believe that the current research effort will serve to strengthen this claim.

Archaeological investigations along the Bear Mountain Segment also reveal a 2500 year history of families and villages making an annual fall migration from the Kern River Valley up into mountain areas near Chimney and Lamont Meadows to harvest pinyon. This traditional pattern of pinyon collection is still practiced today by much of the Native American community of the Kern River Valley. At the same time, much of the surrounding area near the Bear Mountain Segment is subject to large scale commercial pinyon harvesting. The Native American community is indignant at having to compete with commercial operators. In formulating land use policy for upland pinyon areas we urge the Bureau of Land Management to consider the ancient, yet still ongoing, traditions of native plant use by local Native American groups.

Social Significance

The authors believe that the story that unfolds as the result of the study of man's past affirms the vast heterogeneity of human experience. Lifeways long dead, concepts of thought only dimly remembered, remain, if only partially, manifest in the gray deposits and artifacts contained in archaeological sites. For many individuals this knowledge has the capability of enriching their present existence. For others it may even be said that this knowledge contains a transcendant alternative to the often numbing values of modern mass culture.

We believe that in publicly financed cultural resource management projects it is encumbent upon the archaeological community and the government to provide the general public convenient access to research findings. Several vehicles are available for this effort and are more fully discussed in terms of management recommendations.

Potential Adverse Impacts

To provide responsible management recommendations it is important to delineate not only the present degree of disturbances exhibited at the sites in question, but also the potential adverse impacts resulting from increasing use of the Pacific Crest Trail.

At the onset of fieldwork for the current research effort, much of the Bear Mountain Segment of the Pacific Crest Trail had already been constructed. One may question the decision of the Bureau of Land Management to engage in trail construction before the completion of this project, but, in general, the trail was routed in such a way as to minimize direct impacts on cultural resources (Montizambert 1978). The future adverse impacts on the cultural resources of the Bear Mountain Segment will primarily result from the indirect effects of increasing hiking and camping activity (Montizambert 1978).

Below is presented a brief discussion of each site detailing the disturbances observed at the beginning of fieldwork. In addition, each site is briefly evaluated according to its susceptibility to future adverse impacts (see individual site descriptions for more detailed information).

KR-39 Present Condition -- heavily disturbed
Potential Adverse Impacts -- heavy camping activity.
Comments - Mining, road construction, and camping activity have severely damaged much of KR-39. Small portions of the midden and some peripheral areas of the flaked stone scatter remain undisturbed. KR-39 is flat and is close to water. As such, it would probably serve as a prime location for camping activity by hikers.

KR-41 Present Condition -- heavily disturbed
Potential Adverse Impacts -- heavy camping activity
Comments - Modern habitations, road construction, and camping activity have severely disturbed much of KR-41. Small portions of undisturbed midden and vast quantities of surface flaked stone material remain. KR-41 is flat, provides a magnificant view of Lamont Meadow and is close to water. As such, it will probably serve as a prime location for camping by hikers.

KR-42 Present Condition -- moderately disturbed
Potential Adverse Impacts -- light camping activity
Comments - Road construction has disturbed the western edge of the site. While KR-42 is not a particularly good camping area, it is adjacent to a small creek and, as such, may be subject to brief stopovers (as well as surface collection) by trail hikers.

KR-43 Present Condition -- undisturbed
Potential Adverse Impacts -- moderate camping activity
Comments - KR-43 is 100% surface collected during the current research effort. A large area of undisturbed midden remains. KR-43 provides a scenic flat area that protrudes from the main ridge and will undoubtedly be used as a camping area for hikers.

KR-44 Present Condition -- undisturbed
Potential Adverse Impacts -- moderate camping activity
Comments - KR-44 was 100% surface collected during the current research effort. A large undisturbed midden still remains as well as one partially excavated rock ring feature. KR-44 is located on a scenic flat area that protrudes from the main ridge and will undoubtedly be used as a camping area by hikers.

KR-46 Present Condition -- moderately disturbed
Potential Adverse Impacts -- light camping activity
Comments - A range enhancement program involving the chaining of pinyon forest has disturbed much of the peripheral areas of KR-46. The undisturbed portion of the site has been 100% surface collected during the current research effort. A small area of undisturbed midden remains. KR-46 provides a scenic flat area for camping.

KR-48 Present Condition -- moderately disturbed
Potential Adverse Impacts -- light camping activity
Comments - A dirt road bisects KR-48 although this appears to be the only major disturbance at this site. Only 10% of the site's surface area was collected during field reconnaissance. KR-48 does not provide a good camping location for hikers but may occasionally serve as a temporary rest area. For this reason it may be subject to unauthorized surface collection of artifacts.

KR-49 Present Condition -- slightly disturbed
Potential Adverse Impacts -- light camping activity
Comments - As mentioned in the site description, the surprising lack of formalized tools at this site may be indicative of unauthorized surface collection. Only 25% of the site's surface area was collected during field reconnaissance. KR-49 is located on a ridge saddle that provides a wide panorama of the surrounding countryside. As such, it will probably be utilized as a camping area by hikers.

KR-50 Present Condition -- undisturbed
Potential Adverse Impacts -- light camping activity
Comments - KR-50 was 100% surface collected during the current research effort. A small amount of undisturbed midden remains. KR-50 provides a scenic flat area that will probably be used as a camping area by hikers.

KR-53 Present Condition -- lightly disturbed
Potential Adverse Impacts -- none
Comments - The site was 100% surface collected during the course of the project. No other cultural remains were observed at KR-53.

KR-57 Present Condition -- moderately disturbed
Potential Adverse Impacts -- moderate camping activity
Comments - Road cuts and some mining activity have disrupted the eastern and western perimeters of KR-57, but midden areas and the remaining flaked stone scatter appear to be undisturbed. KR-57 provides a broad flat ridge line saddle that could serve as a convenient place to camp. The Pacific Crest Trail crosses the site at some distance from the midden areas.

KR-60 Present Condition -- undisturbed
Potential Adverse Impacts -- moderate camping activity
Comments - KR-60 was 100% surface collected during the current research effort. A shallow undisturbed midden remains as well as three partially excavated rock ring features. KR-60 provides a scenic flat area that protrudes from the main ridge that will undoubtedly be used as a camping area by hikers.

KR-64 Present Condition -- heavily disturbed
Potential Adverse Impacts -- light camping activity
Comments - KR-64 has been heavily damaged by road construction activity. Several undisturbed portions of a large midden remain. In addition, only 10% of the surface assemblage was collected. KR-64 is located in a flat saddle suitable for camping by hikers.

KR-71 Present Condition -- undisturbed
Potential Adverse Impacts -- light camping activity
Comments - KR-71 was 100% surface collected during the current research effort. A small undisturbed midden remains. KR-71 possesses a scenic flat area that protrudes from the main ridge that could be used as a camping area by hikers.

KR-73 Present Condition -- undisturbed
Potential Adverse Impacts -- light camping activity
Comments - KR-73 was 100% surface collected. In addition, the western

half of a rock ring feature was excavated. The site is located on a flat ridge yet is some distance from the Pacific Crest Trail. Light camping activity on the flat area occupied by the site could be expected.

Management Recommendations

Mitigation of Potential Adverse Impacts

In terms of recent environmental legislation, mitigation has been defined as "the alleviation of impacts" (Schiffer and Gumerman 1977). Most archaeologists would agree that the first step in the mitigation process involves the exploration for a means to preserve, or at least avoid destruction of, cultural resources. Under this program, large scale data recovery programs involving excavation should be viewed as a last resort (Schiffer and Gumerman 1977). We believe that the current data recovery program coupled with the recommendations detailed below provide a sensible and inexpensive program of mitigation and protection.

Potential adverse impacts would include unauthorized surface collection of artifacts by hikers and campers utilizing the trail. Although the level of intensity at which this may occur can not be predicted now. Fortunately, all site surfaces were systematically sampled and collected during the present research effort. In addition, all site surfaces were 100% surveyed for the purpose of collecting all "diagnostic" artifacts (e.g. projectile points, beads, portable milling equipment, etc.) which are particularly susceptible to unauthorized collecting. We feel that the procedures detailed above have adequately mitigated any potential data loss that <u>may</u> occur as a result of unauthorized surface collection. Any further effort at surface collection would involve large sums of money and generate little new information.

In contrast, subsurface deposits (at those sites that contain subsurface deposits -- KR-39, -41, -43, -44, -46, -50, -57, -60, -64 and -71) have only been minimally sampled during this current project phase. These sites, especially the large pinyon base camps (KR-39, -41 and -57), have yielded an abundance of subsurface data and can be expected to yield much more information if and when a more intensive excavation program is undertaken.

Unfortunately, it is extremely difficult to forecast what effect hiking and camping activity will have on the subsurface deposits at these sites. Several sites, including KR-39 and -41, have been used as camping localities for years, and damage to subsurface deposits at these sites appears to be more the result of road and dwelling construction rather than camping. We are reluctant to recommend full scale excavations until the effects of trail use are more fully understood.

As an alternative, we recommend that the Bureau of Land Management institute a systematic site monitoring program in order to assess the effects of trail use on subsurface archaeological deposits. This would entail the use of photographic plots to establish a base line of current site disturbances. At six month intervals these same plots could be photographed again and be compared to the earlier photographs. In this way unacceptable rates of site deterioration could be detected. This program could be conducted in conjunction with the active monitoring of site

conditions by BLM personnel. If site deterioration is found to be unacceptable, alternative measures, such as excavation, could be implemented.

Other Considerations

Elsewhere we have indicated that the archaeological entities located along the Bear Mountain Segment possess ethnic as well as social significance. As such, access to the findings of this project should be available to all interested people in a format more approachable than this technical report. Two avenues are available in this pursuit.

First, we recommend that the BLM publish a short 10 to 15 page "layman's summary" of the current research project as outlined in this report. This should be written in a clear and imaginative style. This summary should be available to all interested persons, and particular care should be taken to see that it is distributed among the Native American community in the Kern River Valley.

Second, we recommend that the BLM print a small brochure outlining the prehistory, ethnography, and environmental characteristics of the Bear Mountain Segment of the Pacific Crest Trail. This brochure would include a brief description and summary of the current research effort. This document should be available at BLM offices and at trail heads near the Bear Mountain Segment.

REFERENCES

Adam, David
1967 Late Pleistocene and recent palynology in the central Sierra Nevada, California. In Quaternary paleoecology, edited by E.J. Cushing and H.E. Wright, pp. 275-301. Yale University Press, New Haven.

Adams, Cynthia J.
1979 Flaked stone artifacts. In Archaeological investigations in the southern Sierra Nevada: The Lamont Meadow and Morris Peak segments of the Pacific Crest Trail, edited by Alan P. Garfinkel, Robert A. Schiffman, and Kelly R. McGuire, pp. 348-382. Bureau of Land Management, Bakersfield, California.

Amsden, Charles A.
1935 The Pinto Basin artifacts. Southwestern Museum Papers, 9:33-51.

Andrews, Stephen B.
1977a Analyzing pictographs -- communication and terminology. Kern County Archaeological Society Journal, 1:29-32.

1977b Pictographs of the Tübatulabal. Kern County Archaeological Society Journal, 1:33-42.

Andrews, Stephen B. and Stephen Bass
1979 Beads: typology, analysis and chronometrics. In Archaeological investigation- in the southern Sierra Nevada: The Lamont Meadow and Morris Peak segments of the Pacific Crest Trail, edited by Alan P. Garfinkel, Robert A. Schiffman, and Kelly R. McGuire, pp. 280-287. Bureau of Land Management, Bakersfield, California.

Antevs, E.
1952 Climatic history and the antiquity of man in California. University of California Archaeological Survey Reports, 16:23-31.

Applegate, Richard
1978 Atishwan: The dream helper in south-central California. Ballena Press Anthropological Papers No. 13. Socorro, New Mexico.

Barbour, M.G. and J. Majors (editors)
1977 Terrestrial vegetation of California. Wiley-Interscience, New York.

Basgall, Mark E.
1979a Numbers or weights: toward developing a more useful approach to understanding prehistoric faunal exploitation. Paper presented at the Society for California Archaeology meeting, San Luis Obispo.

1979b Bone weights in archaeological faunal analysis: a critique of Casteel's critique. Unpublished paper in author's possession.

Basgall, Mark E. and Bill Hildebrandt
1979 Faunal analysis. In Archaeological investigations in the southern Sierra Nevada: The Lamont Meadow and Morris Peak segment of the Pacific Crest Trail, edited by Alan Garfinkel, Robert Schiffman and Kelly McGuire. Bureau of Land Management, Bakersfield, California.

Bass, Stephen T. and S.B. Andrews
1977 Using a new classification system on Kern County Indian beads. Kern County Archaeological Society Journal, 1:9-24.

Baumhoff, Martin A. and J.S. Byrne
1956 Desert side-notched points as time markers in California. University of California Archaeological Survey Reports 48:32-65.

Baumhoff, M.A. and R.F. Heizer
1965 Postglacial climate and archaeology in the Desert West: In The Quarternary of the United States, edited by H.E. Wright and D.E. Frey, pp. 697-707. Princeton: Princeton University Press.

Baumhoff, M.A. and D.L. Olmsted
1963 Palaihnihan: radiocarbon support for glottochronology. American Anthropology 65(2):278-284.

1964 Notes on Palaihnihan culture history: Glottochronology and archaeology. In Studies in California linguistics, edited by William Bright, pp. 1-12. University of California Publications in Linguistics 34. Berkeley.

Bedwell, Stephen
1973 Fort Rock Basin: prehistory and environment. University of Oregon Books, Eugene.

Bennyhoff, J.A.
1956 An appraisal of the archaeological resources of Yosemite National Park. University of California Archaeological Survey Reports, Vol. 34. Berkeley.

1958 The Desert West: A trial correlation of cultures and chronology. University of California Archaeological Survey Reports, 42:98-112.

Bettinger, Robert L.
1975 The surface archaeology of Owens Valley, eastern California: prehistoric man-land relationships in the Great Basin. Unpublished Ph.D. dissertation. Department of Anthropology, University of California, Riverside.

1976 The development of pinyon exploitation in central eastern California. The Journal of California Anthropology, 3(1):81-95.

1977 The surface archaeology of the Long Valley caldera, Mono County, California. University of California Archaeological Research Unit Monographs 1.

1978 Humboldt basal-notched bifaces as time-markers in the western Great Basin. Tebiwa, 10:1-7.

1979 Archaeology east of the range of light: aboriginal human ecology of the Inyo-Mono region of California. United States Department of Agriculture, Forest Service, San Francisco, California.

Bettinger, Robert and R.E. Taylor
1974 Suggested revisions in archaeological sequences of the Great Basin in interior southern California. Nevada Archaeological Survey Research Paper 5:1-26.

Bischoff, Arthur I.
1975 Productivity in some California deer herds. California Fish and Game, 44:253-259.

Bokonyi, S.
1970 A new method for the determination of the number of individuals in animal bone material. American Journal of Archaeology, 74:291-292.

Bouey, Paul D.
1979 Population pressure and agriculture in the Owens Valley. Journal of California and Great Basin Anthropology, 1(1):162-170.

Bradley, Bruce A.
1975 Lithic reduction sequences: A glossary and discussion. In Lithic technology: Making and using stone tools, edited by Earl Swanson, pp. 5-13. Aldine Publishing Company, Chicago.

Brose, David S.
1975 Functional analysis of stone tools: a cautionary note on the role of animal fats. American Antiquity, 40:86-95.

Brown, M.B.
1977 BMDP biomedical computer programs, P-series 1977. Health Sciences Computing Facility, School of Medicine. University of California Press.

Busby, Colin I., John M. Findlay, and James C. Bard
1979 A cultural resource overview of the Bureau of Land Management Coleville, Bodie, Benton and Owens Valley Planning Units, California. Bureau of Land Management, Bakersfield, California.

Butler, B.R.
1976 The evolution of the modern sagebrush-grass steppe biome on the Eastern Snake River plain. In Holocene Environmental Change in the Great Basin, edited by Robert Elston, pp. 4-39. Nevada Archaeological Survey, Research Paper 6. Reno.

Butterbrett, Inez
1948 Kern County Indians. Unpublished manuscript prepared during archaeological investigation by the California Archaeological Survey. Mimeographed.

Campbell, Elizabeth W.C. and William H. Campbell
1935 The Pinto Basin site. Southwest Museum Papers 9. Los Angeles.

Capp, J.C.
1968 Bighorn sheep, elk, and mule deer range relationships. Rocky Mountain Nature Association. Estes Park, Colorado.

Cappannari, Stephen C.
1950 The concept of property among Shoshoneans. Unpublished Ph.D. dissertation. Department of Anthropology, University of California, Berkeley.

Casteel, Richard
1977a A consideration of the behavior of the minimum number of individuals index: A problem in faunal characterization. Ossa 3/4:141-151.

1977b Characterization of faunal assemblages and the minimum number of individuals determined from paired elements: continuing problems in archaeology. Journal of Archaeological Science, 4:125-134.

1978 Faunal assemblages and the "Wiegemethode" or weight method. Journal of Field Archaeology 5:71-77.

Cawley, J.J.
n.d. Rock art of Kern County. Unpublished manuscript in author's possession.

Chaplin, R.E.
1971 The Study of Animal Bones from Archaeological Sites. Seminar Press, New York.

Clewlow, C.W., Jr.
1967 Time and space relations of some Great Basin projectile point types. University of California Archaeological Survey, Reports, 70:141-149. Berkeley.

Clewlow, C.W., Jr., R.F. Heizer and R.Berger
1970 An assessment of radiocarbon dates for the Rose Spring site (CA-Iny-372), Inyo County, California. University of California Archaeological Research Facility, Contributions 7:19-27.

Cohen, Mark
1977 The food crisis in prehistory: Overpopulation and the origins of agriculture. Yale University Press, New Haven.

Collins, Michael B.
1975 Lithic technology as a means of processual inference. In Lithic technology: Making and using stone tools, edited by Earl Swanson, pp. 15-34. Aldine Publishing Company, Chicago.

Coville, Frederick V.
1892 The Panamint Indians of California. American Anthropologist, 5:351-361.

Cowan, Richard and Kurt Wallof
1974 Fieldwork and artifact analysis: Southern California Edison No. 2 control - Casa Diablo 115 Kv transmission line. Manuscript on file at the Dry Lands Research Institute, University of California, Riverside.

Crabtree, Don E.
1973 The obtuse angle as a functional edge. Tebiwa, 16:45-53.

Curry, Robert
1969 Holocene climatic and glacial history of the central Sierra Nevada, California. In United States Contributions to Quaternary Research, edited by S.A. Schunn and W.C. Bradley, pp. 1-47. Geological Society of America Special Paper 123.

Davis, Emma Lou
1963 The desert culture of the western Great Basin: a lifeway of seasonal transhumance. American Antiquity, 29:202-212.

1964 An archaeological survey of the Mono County basin and excavations of two rockshelters, Mono Lake, California. University of California Archaeological Survey Annual Report 163-164: 251-392.

1965 An ethnography of the Kuzedika Paiute of Mono Lake, Mono County, California. University of Utah Anthropological Papers, 8:1-55.

Davis, Emma Lou (ed.)
1978 The ancient Californians, Rancholabrean hunters of the Mojave Lake country. Natural History Museum of Los Angeles County, Science Series 29.

Davis, Emma Lou, C.W. Brott and D.L. Weide
1969 The Western Lithic Co-Tradition. San Diego Museum of Man, Papers No. 6:1-97.

Driver, Harold E.
1937 Culture element distributions, VI: Southern Sierra Nevada. University of California Anthropological Records 1(2):53-154. Berkeley.

1938 Culture element distributions VIII: The reliability of culture element data. Anthropological Records, 1:205-219.

Dutcher, B.H.

1893 Piñon gathering among the Panamint Indians. American Anthropologist, 6:377-380.

Einarsen, A.S.

1948 The Pronghorn Antelope and its management. Wildlife Management Institute, Washington, D.C.

Elston, R., J. Davis, and G. Townsend

1976 Coastal, geomorphology of the south shore of Lake Tahoe. In Holocene environmental change in the Great Basin, edited by Robert Elston, pp. 40-65. Nevada Archaeological Survey Research Paper 6. Reno.

Ericson, Jonathon

1977 Prehistoric exchange systems in California: the results of obsidian dating and tracing. Unpublished Ph.D. dissertation. Department of Anthropology, University of California, Los Angeles.

1978 Obsidian hydration dating in California. Society for California Archaeology, Occasional Papers in Method and Theory in California Archaeology No. 2, pp. 43-57.

Fenenga, Franklin

1975 A Washo pine nut camp in Douglas County, Nevada. The Journal of California Anthropology, 2:205-213.

Fitzwater, R.J.

1962 Final report on two seasons excavation at El Portal, Mariposa County, California. University of Califronia at Los Angeles Archaeological Survey Annual Report, 4:234-285.

1964 Excavations at Crane Flat, Yosemite National Park. United States National Park Service, Western Service Center, San Francisco.

1968 Big Oak Flat: Two archaeological sites in Yosemite National Park. University of California Archaeological Survey Annual Report, 2:155-200. Los Angeles.

Flannery, Kent V.

1966 The postglacial "readaptation" as viewed from Mesoamerica. American Antiquity, 31:800-805.

1967 The vertebrate fauna and hunting patterns. In The prehistory of the Tehuacan Valley, edited by D.S. Byers, pp. 132-177. University of Texas Press, Austin.

Fowler, Catherine S.
1972 Some ecological clues to Proto-Numic homelands. In Great Basin cultural ecology: a symposium, edited by Don D. Fowler, pp. 105-121. Desert Research Institute Publications in the Social Sciences No. 8.

Frison, G.C.
1971 Shoshonean antelope procurement in the Upper Green River Basin, Wyoming. Plains Anthropologist 16(54 Pt 1):258-284.

Garfinkel, Alan P.
1976 A cultural resource management plan for the Fossil Falls/ Little Lake locality. Bureau of Land Management, Bakersfield.

Garfinkel, Alan P., Robert A. Schiffman, and Kelly R. McGuire (editors)
1979 Archaeological investigations in the southern Sierra Nevada: The Lamont Meadow and Morris Peak segments of the Pacific Crest Trail. Bureau of Land Management, Bakersfield, California.

Garfinkel, Alan P. and Roger Cook
1979 The Sherwin Grade site: Prehistoric change in central eastern California. California Department of Transportation Occasional Papers in Archaeology No. 1. Sacramento.

Garfinkel, Alan and Kelly McGuire
1979 Subsistence-settlement systems of the southern Sierra Nevada. In Archaeological investigations in the southern Sierra Nevada: The Lamont Meadow and Morris Peak segments of the Pacific Crest Trail, edited by Alan Garfinkel, Robert Schiffman and Kelly McGuire. Bureau of Land Management, Bakersfield, California.

Geist, V.
1971 Mountain Sheep: A study in behavior and evolution. University of Chicago Press, Chicago.

Gibson, Robert O.
1975 A preliminary analysis of beads from San Buenaventura Mission (Ca-Ven-87). Unpublished manuscript on file at Bakersfield College.

Goss, James
1977 Linguistic tools for the Great Basin prehistorian. In Models and Great Basin prehistory: A symposium, edited by Don Fowler, pp. 49-71. Desert Research Institute Publications in the Social Sciences No. 12. Reno.

Gould, Robert A., Dorothy A. Koster and Ann H. Sontz
1971 The lithic assemblage of the Western Desert Aborigines of Australia. American Antiquity, 36:149-169.

Grant, Campbell, J. Baird and J.K. Pringle
1968 Rock drawings of the Coso Range, Inyo County, California. Maturango Museum Publications 4. China Lake.

Grayson, Donald K.
1973 On the methodology of faunal analysis. American Antiquity, 39:432-439.

1974 The Riverhaven No. 2 vertebrate fauna: comments on methods in faunal analysis and on aspects of the subsistence potential of prehistoric New York. Man in the Northeast 8:23-29.

1978 Minimum numbers and sample size in vertebrate faunal analysis. American Antiquity, 43:53-64.

Grinnel, G.B.
1929 Pronghorn antelope. Journal of Mammalogy 10:135-141.

Grosscup, Gordon L.
1977 Notes on boundaries and culture of the Panamint Shoshone and Owens Valley Paiute. Contributions of the University of California Archaeological Research Facility, 35:109-150.

Guilday, J.H.
1970 Animal remains from excavations at Fort Ligonier. Annals of the Carnegie Museum, 42:177-186.

Gunnerson, James H.
1962 Plateau Shoshonean prehistory: A suggested reconstruction. American Antiquity, 28:41-45.

Hanks, Herrick and Alan P. Garfinkel
1976 Cultural resources, management framework plan for the El Paso/ Red Mountain planning units. Bureau of Land Management, Desert Planning Staff. Riverside, California.

Hale, K.
1958-59 Internal diversity in Uto-Aztecan: I-II. International Journal of American Linguistics, 24:101-7; 25:114-21.

Hall, Mathew and James Barker
1975 Background to prehistory of the El Paso/Red Mountain desert region. United States Department of the Interior, Bureau of Land Management, Riverside, California.

Harrington, M.R.
1957 A Pinto site at Little Lake, California. Southwest Museum Papers, No. 17.

Hayden, Brian (editor)
1979 Lithic use-wear analysis. Academic Press, New York.

Heizer, R.F. and M.A. Baumhoff

1961 Wagon Jack Shelter. University of California Anthropological Records, 20:119-138.

1962 Prehistoric Rock Art of Nevada and Eastern California. University of California Press, Berkeley.

Heizer, Robert F. and C. William Clelow

1968 Projectile points from site NV-Ch-15, Churchill County, Nevada. University of California Archaeological Survey Reports 71:59-88. Berkeley.

Heizer, R.F. and A.E. Treganza

1944 Mines and quarries of the California Indians. California Journal of Mines and Geology Vol. 40, No. 3. Sacramento.

Hester, Thomas R. and Robert F. Heizer

1972 Problems in the functional interpretation of artifacts: Scraper planes from Mitla and Yagul, Oaxaca. Contributions of the Archaeological Research Facility, 14:107-123.

1973 Review and discussion of Great Basin projectile points: forms and chronology. Berkeley - Non-serial publication, Archaeological Research Facility, Department of Anthropology, University of California.

Hill, Mary

1975 Geology of the Sierra Nevada. University of California Press, Berkeley.

Hill, R.R.

1956 Forage, food habits, and range management of the Mule Deer. In The Deer of North America, edited by W.P. Taylor. The Stackpole Co., Harrisburg, and the Wildlife Management Institute, Washington, D.C.

Hopkins, N.

1965 Great Basin prehistory and Uto-Aztecan. American Antiquity, 31(1):48-60.

Ingles, L.G.

1965 Mammals of the Pacific States. Stanford University Press, Palo Alto.

Jaeger, Edmund C.

1941 Desert wildflowers. Stanford University Press, Palo Alto.

Jennings, J.D.

1964 The Desert West: In Prehistoric Man in the New World, edited by J.D. Jennings and E. Norbeck, pp. 149-174. University of Chicago Press, Chicago.

Jett, Stephen C.
1977 Comments on Goss' "Linguistic tools for the Great Basin prehistorian." In models and Great Basin prehistory: a symposium, edited by Don D. Fowler, pp. 71-78. Desert Research Institute Publications in the Social Sciences No. 8. Reno and Las Vegas.

Jones, F.L.
1950 A survey of the Sierra Nevada bighorn. Sierra Club Bulletin 35:29-36.

Keeley, L.H.
1974 Technique and methodology in microwear studies: A critical review. World Archaeology 5:323-336.

Keeley, L.H. and M.H. Newcomer
1977 Microwear analysis of experimental flint tools: A test case. Journal of Archaeological Science 4:29-62.

Keller, Charles M.
1966 The development of edge damage patterns on stone tools. Man, 1:501-511.

King, Chester
1974 The explanation of differences and similarities among beads used in prehistoric and early historic California. In Antap California Indian political and economic organization, edited by Lowell John Bean and Thomas F. King, pp. 75-92. Ballena Press Anthropological Papers No. 2. Ramona.

King, T.J.
1976 Late Pleistocene-early Holocene history of coniferous woodlands in the Lucerne Valley region, Mojave Desert, California. Great Basin Naturalist, 30:227-238.

Knudson, Ruthann
1973 Organizational variability in late Paleo-Indian assemblages. Ph.D. dissertation, Washington State University, Pullman: University Microfilms, Ann Arbor.

1975 An outline for the description and analysis of flaked lithic artifacts. Manuscript, Department of Sociology/Anthropology, University of Idaho, Moscow.

Kowta, Makoto
1969 The Sayles Complex: A late milling stone assemblage from Cajon Pass and the ecological implications of its scraper planes. University of California Publications in Anthropology 6.

Krantz, G.S.
1968 A new method of counting animal bones. American Anthropologist, 72:286-288.

Kroeber, Alfred L.
1925 Handbook of the Indians of California. Bureau of American Ethnology, Bulletin 78.

LaMarche, V.C.
1973 Holocene climatic variations inferred from treeline fluctuations in the White Mountains, California. Journal of Quaternary Research, 3:632-660.

Lamb, S.
1958 Linguistic prehistory in the Great Basin. International Journal of American Linguistics, 24:95-100.

Lanning, E.P.
1963 The archaeology of the Rose Spring Site (Iny-372). University of California Publications in American Archaeology and Ethnology, 49:3:327-336.

Layton, T.N.
1970 High rock archaeology: An interpretation of the prehistory of the northwestern Great Basin. Unpublished Ph.D. dissertation, Department of Anthropology, Harvard University.

Leopold, A., T. Riney, R. McCain and L. Tevis, Jr.
1951 The jawbone deer herd. California Fish and Game Bulletin No. 4.

Levi, Jerome
1978 Wii'ipay: The living rocks - ethnographic notes on crystal magic among some California Yumans. The Journal of California Anthropology, 5(1):42-52.

Longhurst, W.O., A. Leopold, and R. Dasmann
1952 A survey of California deer herds, their ranges, and management problems. California Fish and Game. Game Bulletin No. 6.

Madsen, David
1975 Dating Paiute-Shoshoni expansion in the Great Basin. American Antiquity, 40:82-86.

Major, J.
1977 California climate in relation to vegetation. In Terrestrial Vegetation of California, edited by Michael Barbour and Jack Major. Wiley-Interscience, New York.

May, Ronald V.
1979 Ceramic artifacts in archaeological investigations in the southern Sierra Nevada: The Lamont Meadow and Morris Peak segments of the Pacific Crest Trail, edited by Alan P. Garfinkel, Robert A. Schiffman and Kelly R. McGuire, pp. 276-279. Bureau of Land Management, Bakersfield.

McGuire, Kelly R. and Alan P. Garfinkel
1976 Comment on "The development of pinyon exploitation in Central Eastern California." The Journal of California Anthropology, 3(2):83-85.

McGuire, Kelly and Alan Garfinkel
1979 The nature and antiquity of pinyon exploitation in the southern Sierra Nevada. In Archaeological investigations in the southern Sierra Nevada: the Lamont Meadow and Morris Peak segments of the Pacific Crest Trail, edited by Alan Garfinkel, Robert Schiffman and Kelly McGuire. Bureau of Land Management, Bakersfield, California.

McLean, D.D.
1944 The Prong-horned Antelope in California. California Fish and Game, 30:221-241.

Mehringer, Peter
1967 Pollen analysis of the Tule Springs area, Nevada. In Nevada State Museum Anthropological Papers No. 13, edited by H.M. Wormington and Dorothy Ellis, pp. 105-128.

1977 Great Basin Late Quaternary environments and chronology. In Models and Great Basin Prehistory: a Symposium, edited by Don Fowler, pp. 113-169. Desert Research Institute Publications in the Social Sciences No. 12. Reno.

Meighan, Clement
1955 Notes on the archaeology of Mono County, California. University of California Archaeological Survey Reports, 28:2-28.

1978 Obsidian dating of the Malibu site. In Obisidan Dates II: A compendium of the obsidian hydration determinations at the UCLA obsidian hydration laboratory, edited by C.W. Meighan and P.I. Vanderhoeven, pp. 158-161. UCLA Institute of Anthropology Monograph 6.

Miller, Wick, J. Tanner, and L. Foley
1971 A lexicostatistic study of Shoshoni dialects. Anthropological Linguistics, 13(4):142-164.

Montizambert, Eric
1978 Cultural resource evaluation of the Bear Mountain segment of the Pacific Crest Trail. United States Department of the Interior, Bureau of Land Management, Bakersfield, California.

Moratto, M.J.
1972 A study of prehistory in the southern Sierra Nevada foothills, California. Ph.D. dissertation. University Microfilms, Ann Arbor.

1977 Research projects: New Melones archaeological project. In Conservation archaeology: A guide for cultural resource management studies, edited by Michael B. Schiffer and George J. Gumerman, pp. 401-412. Academic Press, New York.

Moratto, M., T. King, and W. Woolfender
1979 Archaeology and California's climate. The Journal of California Anthropology, 8(2):147-162.

Muir, John
1922 The Mountains of California. Century Company, New York.

Munz, P.A. and D.D. Keck
1963 A California Flora. University of California Press, Berkeley.

Murphy, R.F.
1970 Basin ethnography and ecological theory. In Languages and Cultures of Western North America, edited by E. Swanson. Idaho State University Press, Pocatello

Newcomer, M.H.
1971 Some quantitative experiments in handaxe manufacture. World Archaeology, 3:85-194.

Noble, Daryl
1978 Appendix A: Lithic tool analysis at Tuo-767. In The Sanguinetti quarry site: An archaeological excavation on the Sonora bypass, District 10, Tuolumne County, California by Michael F. Rondeau. Archaeological Study Center, Department of Anthropology, California State University, Sacramento.

O'Connell, J.F.
1971 The archaeology and cultural ecology of Surprise Valley, northeast California. Unpublished Ph.D. dissertation. Department of Anthropology, University of California, Berkeley.

Odell, George
1974 Microwear in perspective: A systematic response to Lawrence H. Keeley. World Archaeology, 7:226-240.

Orr, R.T.
1940 The rabbits of California. California Academy of Sciences, Occasional Papers 19.

Panlaqui, C.
1974 The Ray Cave site. In Excavations of two sites in the Coso Mountains of Inyo County, California. Maturango Museum Monograph No. 1. China Lake.

Perkins, D. Jr.
1973 A critique on the methods of quantifying faunal remains from archaeological sites. In Domestikationsforschung und Geschichte der Haustieve, edited by J. Matolsci.

Phagan, Carl J.
1976 A method for the analysis of flakes in archaeological assemblages: a Peruvian example. Unpublished Ph.D. dissertation, Ohio State University, Columbus.

Phillipson, Laurel and David Phillipson
1970 Patterns of edge damage on the Late Stone Age industry from Chiwemupula, Zambia. Zambia Museums Journal, 1:40-75.

Price, J.A.
1962 Washo economy. Nevada State Museum Anthropological Papers 6. Carson City.

Rhode, David
1979 Environmental background and ethnobotany. In Archaeological investigations in the southern Sierra Nevada: The Lamont Meadow and Morris Peak segments of the Pacific Crest Trail, edited by Alan P. Garfinkel, Robert A. Schiffman, and Kelly R. McGuire. Bureau of Land Management, Bakersfield, California.

Riddell, Harry Jr. and Francis Riddell
1956 The current status of archaeological investigations in Owens Valley. University of California Archaeological Survey Report 42.

Salt, Timothy R.
1979 Bear Mountain Segment Pacific Crest Trail oral environmental analysis documentation. On file, Bureau of Land Management, Bakersfield, California.

Salzman, Sally
1977 The valley of the south fork of the Kern River: cultural resource management proposals for the Long Canyon Village site. Bureau of Land Management, Bakersfield, California.

Schiffer, Michael B. and George J. Gumerman
1977 Conservation archaeology: A guide for cultural resource management studies. Academic Press, New York.

Semenov, S.A.
1964 Prehistoric technology: An experimental study of the oldest tools and artifacts from traces of manufacture and wear. London: Cory, Adams and Mackay.

Severinghaus, C.W. and E.L. Cheatum
1956 Life and times of the White-Tailed deer. In The deer of North America, edited by W.P. Taylor. Wildlife Management Institute, Washington, D.C.

Sheets, Payson D.
1973 Edge abrasion during biface manufacture. American Antiquity, 38:215-218.

Simons, Dwight D.
1973 You eat what you are: animal behavior and its effects on prehistoric animal behavior. Manuscript in author's possession.

Simons, Dwight D. and M.E. Basgall
1978 Vertebrate remains from CA-Lak-702. Manuscript on file with California Department of Transportation, Sacramento.

Singer, Clay H. and Robert O. Gibson
1970 The Medea Creek village site (4-LAN-243v): A functional lithic analysis. University of California Archaeological Survey Annual Report, 12:184-205. Los Angeles.

Skinner, M.P.
1922 The pronghorn. Journal of Mammalogy, 3:82-106.

Smith, Bruce D.
1975 Middle Mississippi exploitation of animal populations. Anthropological Papers, Museum of Anthropology, University of Michigan No. 57.

Smith, Charles R.
1978 Tübatulabal. In The Handbook of North American Indians, Vol. 8: California, edited by R.F. Heizer. Smithsonian Institution, Washington, D.C.

Steward, Julian H.
1933 Ethnography of the Owens Valley Paiute. University of California Publications in American Archaeology and Ethnology, 33:233-350.

1938 Basin-plateau aboriginal sociopolitical groups. Bureau of American Ethnology Bulletin 120.

1955 Theory of Culture Change. University of Illinois Press, Urbana.

1976 Evolution and Ecology. University of Illinois Press, Urbana.

Storer, T.I., and R.L. Usinger
1963 Sierra Nevada Natural History. University of California Press, Berkeley.

Struever, S.
1971 Comments on archaeological data requirements and research strategy. American Antiquity, 36:9-19.

Taylor, W.W.
1961 Archaeology and language in western North America. American Antiquity, 27:71-81.

Thomas, David Hurst
1970 Archaeology's operational imperative: Great Basin projectile points as a test case. University of California Archaeological Survey Annual Report, 12:27-60. Los Angeles.

1971 Subsistence-settlement patterns in the Reese River Valley, Central Nevada. Unpublished Ph.D. dissertation, Department of Anthropology, University of California, Davis.

1972 Unmodified mammal remains from NV-Pe-104. In The Archaeology of the Barrel Springs Site, edited by R. Cowan. Archaeological Research Facility, University of California, Berkeley. pp. 41-48.

Thomas, David Hurst and Robert L. Bettinger
1976 Prehistoric piñon ecotone settlements of the Upper Reese River Valley, central Nevada. Anthropological Papers of the American Museum of Natural History Volume 53, Part 3.

Thomas, David Hurst and Edwin McKee
1973 An aboriginal rock alignment in the Toiyabe Range, central Nevada. American Museum of Natural History Novitates. New York.

Trigger, B.G.
1968 The determinants of settlement patterns. In Settlement Archaeology, edited by K.C. Chany, pp. 53-78. Palo Alto: National Press Books.

Tringham, Ruth, Glenn Cooper, George Odell, Barbara Voytek and Anne Whitman
1974 Experimentation in the formation of edge damage: a new approach to lithic analysis. Journal of Field Archaeology, 1(½):171-196.

True, Delbert L.
1966 Archaeological differentiation of Shoshonean and Yuman speaking groups in southern California. Unpublished Ph.D. dissertation, Department of Anthropology, University of California, Los Angeles.

Twisselmann, E.C.
1967 A flora of Kern County, California. Wasmann Journal of Biology, 25(1-2).

U.S. Weather Bureau
1964 The Climate of Kern County. Prepared by U.S. Weather Bureau (C. Robert Elford and Max R. McDonough). Bakersfield, California. Kern County Board of Trade.

Van Dervender, T. and W. Spaulding
1979 Development of vegetation and climate in the southwestern United States. Science 204:701-710.

Voegelin, Erminie
1938 Tübatulabal ethnography. Anthropological Records, Vol. 2, No. 1. University of California Press, Berkeley.

Walker, Philip L.
1978 Butchery and stone tool function. American Antiquity, 43(4):710-715.

Wilmsen, Edwin N.
1970 Lithic analysis and cultural inference: A paleo-Indian case. Anthropological Papers No. 16. University of Arizona Press, Tucson.

White, J. Peter and David H. Thomas
1972 What mean these stones? Ethno-taxonomic models and archaeological interpretations in the New Guinea highlands. In Models in Archaeology, edited by David L. Clarke, pp. 275-308. Harper and Row, New York.

White, T.E.
1953 A method of calculating the dietary percentages of various food animals utilized by aboriginal peoples. American Antiquity, 18:396-398.

Wildesen, L.E.
1974 Archaeological Impact Evaluation: Southern California Edison Company proposed HTGR Nuclear Power Plant in Vidal Valley, California, and Associated Transmission Line Routes. Dry Lands Research Institute, University of California, Riverside.

Wylie, Henry G.
1975 Tool microwear and functional types from Hogup Cave, Utah. Tebiwa, 17:1-31.

Ziegler, Alan C.
1973 Inference from prehistoric faunal remains. Addison Wesley Modules in Anthropology No. 43.

Zigmond, Maurice L.
1938 Kawaiisu territory. Tribal distribution in the Great Basin. Edited by Willard Z. Park (et al.) American Anthropologist, 40:634-638.

1941 Ethnobotanical Studies among California and Great Basin Shoshoneans. Ph.D. dissertation, Yale University. University Microfilms, Ann Arbor.

1972 Some mythological and supernatural aspects of Kawaiisu ethnography and ethnology. In Great Basin cultural ecology: a symposium. Edited by Don D. Fowler, pp. 129-134. Desert Research Institute Publications in the Social Sciences No. 8. Reno.

APPENDIX 1

DESCRIPTION AND CLASSIFICATION OF BEADS

All beads recovered during fieldwork were classified by Stephen Bass and Stephen Andrews of Bakersfield, California, who have developed a useful classification system for beads found in Kern County, California (Bass and Andrews 1977). In this system each bead is classified and identified in six major categories. These categories include the general material from which the bead is made (stone, shell, glass etc.); the specific stone or shell from which the bead is made (steatite, Olivella, etc.); or, in the case of glass beads, the type of manufacturing process used (cane, wire wound, etc.). These attributes are followed by size measurements, color, and unique characteristics (color quality, markings, etc.). The identification marks for the system follow the same sequence as an outline. The outline would appear as follows:

I. General material
  A. Subclass material
    1. Shape
      a. Diameter of bead
      b. Diameter of performation
      c. Thickness of bead
        (1) Color
          (a) color qualities and markings.

In classifying a bead, after the general and subclass materials are determined, the size (shape) of the bead is measured in three dimensions. As shown in the outline, each measurement is represented by a lower case letter. The three measurements always fall in the same order as illustrated in the outline. First, the diameter of the bead is measured, followed by the diameter of the performation. The thickness of the bead is then calibrated. In the case of whole shells, such as the Olivella, the thickness measured reflects the length of the shell. This measurement is consistent with the measurement of thickness in other beads, as all would be strung on strings, exposing the measured surface in a like manner. In cases where the diameter of the bead varies, the longest measurement is recorded.

Colors are marked using numbers in parentheses, while the qualities of colors, special markings, etc., are noted by placing lower case letters in parentheses. In this last category there are instances where letters may be used together in conjunction with numbers for colors to indicate peculiarities. These last two categories apply to all types of beads.

Andrews-Bass Typology for Beads

GENERAL MATERIAL

I. Stone
II. Shell
III. Glass
IV. Clay
V. Wood
VI. Seed

SUBCLASS MATERIAL, MANUFACTURING

I. Stone

S - Steatite
R - Serpentine
T - Talc schist

II. Shell

H - _Haliotis nacreous_
Hre - _Haliotis rufescens_ epidermis
O - _Olivella biplicata_
T - _Tivela stultorum_
M - _Mytilus californicus_
P - _Pusula californiana_
L - _Limpet_

III. Glass

C - Cane
W - Wire wound
B - Blown
F - Faceted
P - Pressed

SHAPE

1. Flat, disc (greater diameter than thickness)
2. Cylindrical (flat at ends, large hole, grain with diameter)
3. Tubular (rounded at ends, longer than cylinders, grain with length)
4. Ring (rounded with large hole)
5. Rectangular, also includes square
6. Barrel (bulges in center)

Shell

7. Saucer, disc
8. Rough, irregular saucer disc
9. Cupped (hole less than 2 mm) (bab,bbb)
10. Thin lipped round (like cupped--hole is greater than 2 mm)
11. Full lipped (like saucer, with callus lip)
12. Whole spire lopped (_Olivella_)
13. Whole spire lopped diagonally (_Olivella_)
14. Whole spire lopped, end ground
15. Half (includes split-punched, split drilled)

Glass

7. Oblate spheroid
8. Spheroid
9. Ovoid
10. Hexagonal tubular (6 facets) (rectangular)
11. Hexagonal tubular w/end facets (diamonds)
12. Heptagonal tubular (7 facets)
13. Octagonal w/3 rows of facets

SIZE (determined at longest point--measured in millimeters)

Diameter

a. 2 mm and less
b. 2 mm to 4 mm
c. 4 mm to 7 mm
d. 7 mm to 9 mm
3. 9 mm to 11 mm
f. 1 mm to 15 mm
g. 15 mm to 19 mm
h. 19 mm to 22 mm
i. 22 mm

Diameter of Hole

a. 1 mm and less
b. 1 mm to 2 mm
c. 2 mm

Thickness

a. 1 1/2 mm
b. 1 1/2 mm to 2 mm
c. 2 mm to 4 mm
d. 4 mm to 7 mm
e. 7 mm to 10 mm
f. 10 mm to 13 mm
g. 13 mm to 16 mm
h. 16 mm to 19 mm
i. 1 mm to 22 mm
j. 22 mm to 25 mm
k. 25 mm

COLORS

(1) White (cream in shells)
(2) Black (dark in shells)
(3) Orange (amber)
(4) Cobalt blue
(5) Copper blue (turquoise)
(6) Red
(7) Green
(8) Yellow
(9) Brown
(10) Purple
(11) Violet
(12) Gray
(13) Maroon
(14) Salmon
(15) Pink
(16) Clear
(17) Rose
(18) Pale blue

COLOR QUALITIES, MARKINGS, ETC.

(a) transparent, crystal
(b) translucent
(c) opaque
(d) burnt
(e) bicolored
(f) bicolored core
(g) painted
(h) striped
(i) light
(j) dark
(k) patinated
(l) incised xxx
(m) incised ///
(n) incised ---
(o) incised other, intricate
(p) punched hole, not drilled
(q) diagonally drilled hole
(r) diagonally ground
(s) slit hole
(t) irregular shaping

Below is a description and the Bass-Andrews classification of beads found along the Bear Mountain Segment of the Pacific Crest Trail:

Provenience			Cat. No.	Bass-Andrews Type	Description
KR-39	N21/W3	0-10 cm	39-431	ISldcc(12) broken	Steatite disk
KR-39	N21/W3	0-10 cm	39-432	II07dba(1)	Olivella disk
KR-39	N21/W3	0-10 cm	39-433	II07cba(1)	Olivella disk
KR-39	N21/W3	0-10 cm	39-434	IIIC7bab(6b)	Translucent red glass
KR-39	N21/W3	0-10 cm	39-435	IIIc7bbc(2c)	Opaque black glass
KR-39	N21/W3	0-10 cm	39-436	IIIF10ccd(4b)	Translucent cobalt blue glass
KR-39	N21/W3	0-10 cm	39-437	IIIF10ccd(4b)	Translucent cobalt blue glass
KR-39	N21/W3	0-10 cm	39-438	IIIF10ccd(4b)	Translucent cobalt blue glass
KR-39	N21/W3	0-10 cm	39-439	IIIF11ccd(4b)	Translucent cobalt blue glass
KR-39	N21/W3	0-10 cm	39-440	IIIC7bbc(6b,f2c)	Translucent red with opaque black center
KR-39	N21/W3	0-10 cm	39-441	IIIC7ccb(6b,f,2c)	Spheroid, translucent red with opaque black center
KR-39	N21/W3	30-40 cm	39-623	IIIC2bbc(4b)	Translucent cobalt blue glass
KR-39	N4/W23	0-10 cm	39-004	ISldca(12)	Steatite disk
KR-39	N4/W23	0-10 cm	39-005	II07bba(1)	Olivella disk
KR-39	N4/W23	10-20 cm	39-019	ISldcc(3)	Steatite disk
KR-39	N4/W23	10-20 cm	39-020	ITlcca(2,m)	Talc schist disk
KR-39	N4/W23	10-20 cm	39-021	II07caa(1)	Olivella disk
KR-39	N4/W23	10-20 cm	39-022	II07cba(1)	Olivella disk
KR-39	N4/W23	10-20 cm	39-023	II07cba(1)	Olivella disk
KR-39	N4/W23	20-30 cm	39-053	IRldcc(7)	Green serpentine disk
KR-39	N4/W23	20-30 cm	39-054	II07caa(1)	Olivella disk
KR-39	N7/W12	0-10 cm	39-279	IIIW2bab(1c)	Opaque white glass
KR-39	N7/W12	0-10 cm	39-280	IIIC7bac(6b)	Translucent red glass
KR-39	N7/W12	10-20 cm	39-333	II07caa(1)	Olivella disk
KR-39	N7/W12	10-20 cm	39-334	II07cba(1)	Olivella disk
KR-39	N7/W12	20-30 cm	39-369	II09baa(1)	Olivella callus cup
KR-39	N24/W6	0-10 cm	39-084	IIIF10cbd(4b)	Translucent cobalt blue glass
KR-39	N24/W6	0-10 cm	39-085	IIIF10ccc(4b)	Translucent cobalt blue glass
KR-39	N24/W6	10-20 cm	39-144	IIIC7bbc(6b,f,1c)	Translucent red glass with opaque white center
KR-39	N24/W6	10-20 cm	39-145	IIIF11cbd(4b)	Translucent cobalt blue glass
KR-39	Surface Transect		39-002	ISlecb(14)	Steatite disk

	Provenience	Cat. No.	Bass-Andrews Type	Description
KR-39	Surface Transect	39-807	IIIF10ccd(4b)	Translucent cobalt blue glass
KR-39	Surface Quadrant (N.W.)	39-861	IIIC7bbc(5b)	Translucent copper blue or turquoise
KR-39	Surface Quadrant (N.W.)	39-865	IIIF10ccd(4bk)	Translucent cobalt blue glass
KR-41	Surface Transect	41-925a	IIIC7baa(1c)	Opaque white glass
KR-41	Surface Transect	41-925b	IIIC7baa(1c)	Opaque white glass
KR-41	Surface Transect	41-925c	IIIC7baa(1c)	Opaque white glass
KR-41	Surface Transect	41-925d	IIIC7baa(1c)	Opaque white glass
KR-41	Surface Transect	41-925e	IIIC7baa(1c)	Opaque white glass
KR-41	Surface Transect	41-049	IS1dca(2,14)	Steatite disk
KR-41	Surface Quadrant (N.E.)	41-900	IIIC7cbc(4b)	Translucent cobalt blue glass
KR-41	N0/E10 0-10 cm	41-542	IS1dcc(3,9)	Steatite disk
KR-41	N0/E6 0-10 cm	41-002	IT1bba(2)	Talc schist disk
KR-41	N0/E6 0-10 cm	41-003	IT1dcc(2,o)	Talc schist disk
KR-41	N0/E6 10-20 cm	41-105	IR1dbc(7,14)	Serpentine disk
KR-41	N0/E6 20-30 cm	41-181	IT1dbc(2)	Talc schist disk
KR-41	N0/E6 20-30 cm	41-182	Is1dbc(14)	Steatite disk
KR-42	Surface Transect	42-193	IT1dcc(2)	Talc schist disk
KR-42	Surface Transect	42-336	IT1dcc(2)	Talc schist disk
KR-42	Surface Transect	42-344	IT1dcc(2)	Talc schist disk
KR-42	Surface Transect	42-474	IS1dcc(9,3)	Steatite disk
KR-42	Surface Transect	42-506	IS1ccc(12)	Steatite disk
KR-42	Surface Transect	42-506	IS1cca(2,12)	Steatite disk
KR-42	Surface Transect	42-519	IT1ccb(2)	Talc schist disk
KR-48	Surface Quadrant (N.W.)	48-183	IIIF10bbd(4b)	Translucent cobalt blue glass
KR-60	Surface Quadrant (N.W.)	60-036	IIF11ccd(4b)	Translucent cobalt blue glass
KR-60	Surface Quadrant (N.E.)	60-119	IIIF11ccd(4b)	Translucent cobalt blue glass
KR-60	N4/E3 0-10 cm	60-053	IIC7bba(6b)	Translucent red glass
KR-73	Surface, rock ring feature	73-003	IIIC7bbc(7b)	Translucent green glass

References

Bass, Stephen and S. B. Andrews
1977 Using a new classification system on Kern County Indian beads. Kern County Archaeological Society Journal, 1:9-24.

APPENDIX 2

POTTERY OF THE SOUTHERN SIERRA NEVADA

Pottery from the two field seasons of archaeological investigation along the Pacific Crest Trail in the southern Sierra Nevada has been analyzed by Ron May. Five potsherds were discovered during the current archaeological program and 25 were identified from the previous study (Garfinkel et al. 1979).

Reexamination of the initial collection of pottery and analysis of those potsherds coming from the present study indicated a need for revision in the previous work which detailed the typological affinities of pottery from the southern Sierra Nevada (May 1979). Current understanding of the variability of the pottery in the southern Sierra Nevada and northwestern Mojave Desert leads to the belief that this collection of pottery is best considered under the rubric of that class of ceramics identified as Owens Valley Brownware (Steward 1928; Riddell 1951).

It is of interest to note that there is a substantial degree of variability within the pottery assemblage and two somewhat distinct subtypes or variants can be identified. These are:

Variant I - Pottery having a very fine paste with inclusions of very fine mica flakes (muscovite) and occasional medium-grained and subangular feldspar sands. The break is even and core color is usually dark brown to black. The outer surface of this pottery is oxidized, as evident when examining the cross-section of a sherd core.

Most specimens are hand-smoothed and stone-polished. A few have no surface treatment and a single specimen exhibits scrape or brush marks.

Distribution and catalogue numbers: PCT 4-005; PCT 15-030(2), 074, 075, 076; PCT 16-016, 110; PCT 20-024, 087, KR 41-913, 923, 995, 1067.

Variant II - Pottery having a sandy paste with medium to coarse inclusions of subangular to rounded feldspar sands. Also a few quartz sands are to be found. The break is very uneven. Core color is usually the same as the surface, which is yellowish-red.

Contrasting with Variant I, these specimens are mostly scraped/brushed and lightly stone polished. The polish is not as fine as that of Variant I. One specimen was smoothed without polish and a few others were left rough with no treatment.

Distribution and Catalogue Numbers: PCT 14-055, 184, 187; PCT 16-015, 021, 022, 023, 024, 054, 096, 097 132(2), 136; 20-023; KR-39-332.

These differences appear significant and several different models can be offered to explain them.

It may be the case that these different variants of pottery represent "lineage" traditions exhibiting regional distinctions perhaps following ethnolinguistic lines or some other criteria.

Also, it might be the case that we are dealing simply with two classes of pottery, one of a finer grade than the other, manufactured by the same people for different purposes. Perhaps the finer quality ware was for trade while the poorer quality was for utilitarian use.

Given the exceedingly small sample further investigation is necessitated in order to determine if either of the above alternatives have merit or some yet to be understood process is at work.

References

Garfinkel, Alan P., Robert A. Schiffman, and Kelly R. McGuire
1979 Archaeological investigations in the southern Sierra Nevada: The Morris Peak and Lamont Meadow Segments of the Pacific Crest Trail. Bureau of Land Management, Bakersfield, California.

May, Ronald V.
1979 Ceramic artifacts. In Archaeological investigations in the southern Sierra Nevada: the Lamont Meadow and Morris Peak segments of the Pacific Crest Trail, edited by Alan P. Garfinkel, Robert A. Schiffman and Kelly R. McGuire, pp. 280-287. Bureau of Land Management, Bakersfield, California.

Riddell, H. S.
1951 The archaeology of a Paiute Village site in Owens Valley. University of California Archaeological Survey Report 12:14-28. Berkeley.

Steward, J. H.
1928 Pottery from Deep Springs Valley, Inyo County, California. American Anthropologist 30:348.

APPENDIX 3

X-RAY FLUORESCENCE ANALYSIS OF ARTIFACTS FROM THE BEAR MOUNTAIN SEGMENT OF THE PACIFIC CREST TRAIL

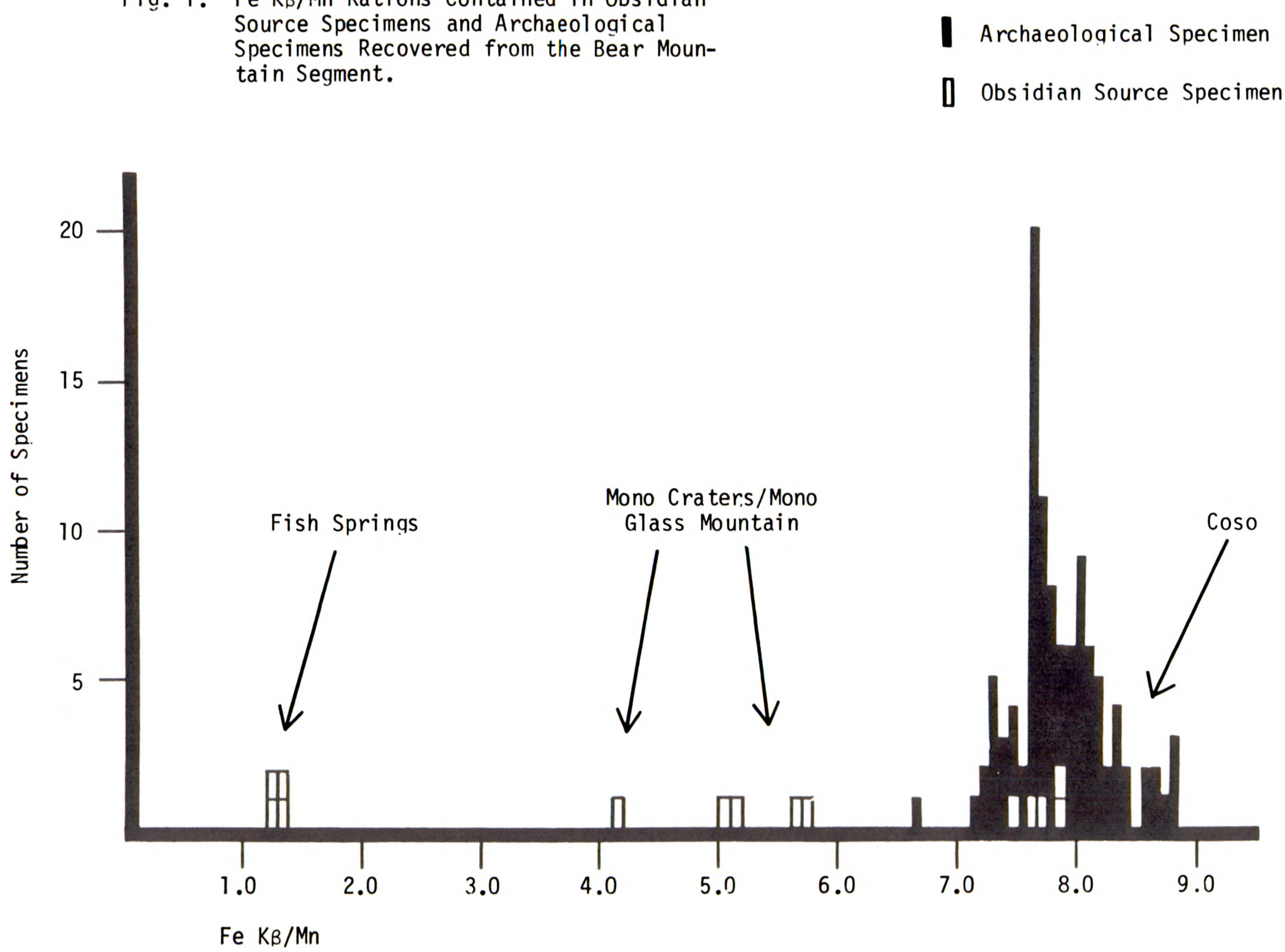
by Richard Hughes

This present study details the results of energy dispersive X-ray fluorescence analysis of 100 obsidian artifacts from 11 archaeological sites located along the Bear Mountain Segment of the Pacific Crest Trail. This study was undertaken to determine the geographic source locations of obsidian used in flaked stone tool manufacture in order to date these specimens using source-specific obsidian hydration rates (Ericson 1977). In addition, source determinations provide data that can be brought to bear on the investigation of regional prehistoric exchange networks.

This study was conducted by Richard Hughes (U.C. Davis) at the Department of Geology and Geophysics (U.C. Berkeley) on a Tracor (Northern) SPECTRACE 440 energy dispersive X-ray fluorescence machine equipped with a 572 power supply (50 kV, 50 watt), an Ag transmission target tube, 534-1 pulsed tube control, 588 Bias/Protection module, TN1221 100mHz ADC, TN-2000 computer based analyzer, and a Si(Li) detector with 142 eV resolution. For this particular analysis, the X-ray tube was operated at 12.0 keV, 1.0 mA pulsed, with an Al filter at 100 seconds livetime.

The Bear Mountain Segment of the Pacific Crest Trail is located near three obsidian sources: Coso Hot Springs, Fish Springs, and Mono Craters/Mono Glass Mountain. Ratios of the trace elements FeKβ and Mn were used to differentiate the source specimens from these three locations (Fig. 1) (Hughes 1979). As can be seen in Figure 1 all project specimens appear to have come from the Coso source. This is not surprising since the study area is in much closer geographic proximity to Coso Hot Springs (ca. 20-40 km) than to Fish Springs (120 km) or the much more distant Mono Crater/Mono Glass Mountain sources.

Fig. 1. Fe Kβ/Mn Rations Contained in Obsidian Source Specimens and Archaeological Specimens Recovered from the Bear Mountain Segment.



Specimen #	Fe Kβ/Mn ratio	Obsidian source
Coso (a)	7.51	Coso
Coso (b)	8.00	Coso
Coso (c)	7.81	Coso
Coso (d)	7.69	Coso
Coso (e)	7.95	Coso
FS-24	1.40	Fish Springs
FS-21	1.34	Fish Springs
FS-40	1.33	Fish Springs
FS-28	1.42	Fish Springs
MGM-L2-5	4.19	Mono Glass Mountain
MGM-L1-5	5.10	Mono Glass Mountain
MGM-L1-2	5.79	Mono Glass Mountain
MC-4	5.17	Mono Craters
MC-7	5.73	Mono Craters
39-008 (a)	7.30	Coso
39-008 (b)	7.77	Coso
39-016	7.67	Coso
39-027	7.83	Coso
39-036	7.60	Coso
39-203	8.57	Coso
39-274	8.93	Coso
39-287	8.36	Coso
39-347	8.64	Coso
39-375	7.89	Coso
39-399	7.78	Coso
39-448	7.99	Coso
39-527	7.54	Coso
39-528	8.21	Coso
39-593	7.66	Coso
39-675	7.56	Coso
39-740	7.85	Coso
39-752	8.01	Coso
39-850	7.86	Coso
41-007	8.11	Coso
41-097	7.69	Coso
41-102	8.03	Coso
41-103	7.68	Coso
41-110	7.23	Coso
41-187	7.40	Coso
41-233	7.73	Coso
41-299	8.29	Coso
41-334	8.18	Coso
41-340	7.65	Coso
41-361	8.52	Coso
41-382	8.14	Coso

Specimen #	Fe Kβ/Mn ratio	Obsidian source
41-496	8.23	Coso
41-533	7.82	Coso
41-547	7.94	Coso
41-549	7.49	Coso
41-550	7.28	Coso
41-551	8.29	Coso
41-630	7.40	Coso
41-680	8.40	Coso
41-681	9.22	Coso
41-682	7.83	Coso
41-683	8.60	Coso
41-689	8.07	Coso
41-726	9.07	Coso
41-739	8.36	Coso
41-805	7.66	Coso
41-859	7.74	Coso
41-883	8.30	Coso
41-897	8.33	Coso
41-899	8.95	Coso
42-037	7.42	Coso
42-136	7.68	Coso
42-205	7.50	Coso
43-027	7.66	Coso
43-032	7.84	Coso
43-064	7.94	Coso
43-067	8.11	Coso
43-069	8.03	Coso
43-071	7.94	Coso
43-075	7.86	Coso
43-076	7.17	Coso
43-078	7.30	Coso
44-115	7.78	Coso
44-119	7.74	Coso
44-123	7.72	Coso
44-124	7.78	Coso
44-126	8.32	Coso
44-129	9.20	Coso
44-130	7.65	Coso
46-108	7.75	Coso
46-111	8.43	Coso
46-114	7.92	Coso
46-118	8.06	Coso
46-120	8.71	Coso
46-121	8.20	Coso
46-124	8.18	Coso
48-184	7.78	Coso
53-074	6.72	Coso
57-040	8.64	Coso
57-286	8.86	Coso
57-427	8.42	Coso
57-429	7.73	Coso

Specimen #	Fe Kβ/Mn ratio	Obsidian source
57-441	8.19	Coso
57-452	8.06	Coso
57-457	8.68	Coso
57-473	7.67	Coso
57-478	7.08	Coso
60-035	8.24	Coso
60-056	9.22	Coso
60-061	8.23	Coso
64-106	7.34	Coso
64-127	7.71	Coso
64-134	7.71	Coso
64-141	8.19	Coso
64-148	7.74	Coso
71-001	7.28	Coso
71-019	8.46	Coso
71-034	7.70	Coso
73-004	8.25	Coso
KR-137	9.01	Coso

References

Ericson, Jonathon
1977 Prehistoric exchange systems in California: the results of dating and tracing. Unpublished Ph.D. dissertation, Department of Anthropology, University of California, Los Angeles.

Hughes, Richard
1979 X-ray flourescence analysis of artifacts from the Lamont Meadow and Morris Peak segments of the Pacific Crest Trail. In Archaeological investigations in the southern Sierra Nevada: the Lamont Meadow and Morris Peak segments of the Pacific Crest Trail, edited by Alan P. Garfinkel, Robert A. Schiffman, and Kelly R. McGuire. Bureau of Land Management, Bakersfield, California.

APPENDIX 4

CHARRED PLANT MACROFOSSILS

By David Rhode

In earlier work (Rhode 1979) the author established the value of collecting charred plant macrofossils from subsurface deposits in sites located in the southern Sierra Nevada. This not only established a method for futher research, but was also useful in reconstructing the subsistence-settlement structure for this region (Garfinkel et al. 1979). The method was very simple: merely collect carbonized plant macrofossils (charcoal, seeds, cone scales, etc.) from the midden deposits which have been passed through one-eighth inch screen.

This method, while simple, significantly biased the sample in favor of large plant remains. To correct this bias we instituted a second technique during the current project along the Bear Mountain Segment of the Pacific Crest Trail. For each level in each excavation unit (excepting the 0-10 cm level which was often contaminated with modern debris) we collected two liters of deposit and processed it using standard water-floatation techniques (c.f. Struever 1968). The light fraction was then scanned through a 6x power dissecting microscope and a desk magnifying lens. This afforded a more complete record of the plant constituents at each site. Results are recorded in each site description in the main body of the report.

It is interesting to note the differences between the results of the two sampling strategies. The first technique, collecting from one-eighth inch screen, results in a large number of identifiable remains representing a wide variety of cone and seed parts as well as species. The second technique, not surprisingly, brought to light the small seeds but it did not contain a diversity of charcoal and cone remains. Both methods augment each other, but collecting in screens seems to offer the more complete record at these sites.

References

Garfinkel, Alan P., Robert A. Schiffman and Kelly R. McGuire
1979 Archaeological investigations in the southern Sierra Nevada: The Lamont Meadow and Morris Peak segments of the Pacific Crest Trail. Bureau of Land Management, Bakersfield, California.

Rhode, David
1979 Plant macrofossils. In Archaeological investigations in the southern Sierra Nevada: The Lamont Meadow and Morris Peak segments of the Pacific Crest Trail, edited by Alan P. Garfinkel, Robert A. Schiffman and Kelly R. McGuire, pp. 317-325. Bureau of Land Management, Bakersfield, California.

Struever, Stuart
1968 Flotation techniques for the recovery of small-scale archaeological remains. American Antiquity 33:353-362.

APPENDIX 5

FLAKED STONE ANALYSIS ATTRIBUTE LIST

Flaked stone items from a single provenience were sorted by raw material type, and then into the two following categories:

1) objective pieces, flakes, and cores bearing the scars of post detachment modification by production or use (Classes I and II);
2) flakes, cores, and shatter with no observable post detachment modification (Classes III and IV).

All Class I and II specimens were assigned permanent catalogue numbers. A series of observations were recorded for each item, as follows:

1. Class
2. Raw Material
3. Weight
4. Implement condition
    0. small fragment, cannot orient flake
    1. medial section, broken across midsection and/or long section which includes part of only one longitudinal edge
    2. medial section, broken across midsection and/or long section which includes part of both lateral edges
    3. terminal section, cannot identify distal or proximal orientation (estimate no more than 1/3 of original flake size)
    4. terminal section, proximal fragment (estimate no more than 1/3 of original flake size)
    5. terminal section, distal fragment (estimate no more than 1/3 of original flake size)
    6. medial and terminal section (estimate 1/2 or more of original flake size), cannot orient distal or proximal position
    7. medial and terminal section, orientation can be determined (d or p) (estimate 1/2 or more of flake's original size)
    8. apparently complete
5. Thinning Evaluation
    a. Dorsal face
        1. edged piece, without cortex remnant
        2. primarily thinned piece, blank
        3. secondarily thinned piece, preform, or shaped piece where the thinning provides significant edge regularity (point, knife, etc.)
        4. highly stylized shaped pieces, i.e. particular projectile point forms (Humboldt, Rose Spring)
        5. indeterminate
    b. Ventral face same as for dorsal face

The number of EUs was recorded for each item. The following series of observation was recorded for each EU:

1. Facial scar location
    0. unifacial
    1. inverse unifacial (rotary)
    2. bifacial
2. Production angle: the angle formed by the surfaces at the point of juncture, taken to the nearest 10°.

3. Damage scar termination
    0. all damage scars feathered
    1. most damage scars feathered, but several or hinged or stepped
    2. most damage scars are hinged or stepped, but several are feathered
    3. all damage scars and hinged or stepped
    4. indeterminate
4. Scar distribution; statement or intensity of damage
    0. seperated or irregularly scattered scars only
    1. seperated scars in some areas, touching scars elsewhere
    2. touching or slightly overlapping scars only
    3. seperated scars in some areas, strongly overlapping ones elsewhere
    4. touching scars in some areas, strongly overlapping ones elsewhere
    5. strongly overlapping scars only
    6. seperated scars in some areas, solid masses of scars elsewhere
    7. touching scars in some areas, solid masses of scars elsewhere
    8. strongly overlapping scars in some areas, solid masses of scars elsewhere
    9. either scattered or touching scars in some areas, and both strongly overlapping and solid masses of scars elsewhere
    10. all scar distribution patterns observed in various areas on edge
    11. only solid masses of scars, individually indistinguishable macroscopically
    12. indeterminate

APPENDIX 6

STATE TRINOMIAL DESIGNATIONS

Site numbers indicated in this report for the Bear Mountain and Lamont Meadow/Morris Peak Trail segments of the Pacific Crest Trail are temporary project numbers designated by the Bureau of Land Management. Just prior to final submission of this report state trinomials were obtained for these sites. A cross-reference of project site numbers and state trinomial designations is contained below.

The Lamont Meadow/Morris Peak Trail Segments (Garfinkel *et al*. 1979)

Temporary Number	State Trinomial
PCT-1	CA-Ker-748
PCT-2	CA-Ker-744
PCT-3	CA-Ker-743
PCT-4	CA-Ker-742
PCT-5	CA-Ker-741
PCT-6	CA-Ker-739
PCT-7	CA-Ker-747
PCT-8	CA-Ker-740
PCT-9	CA-Ker-746
PCT-10	CA-Ker-738
PCT-11	CA-Ker-745
PCT-12	CA-Ker-737
PCT-13	CA-Tul-484
PCT-14	CA-Tul-483
PCT-16	CA-Tul-481
PCT-17	CA-Tul-480
PCT-18	CA-Tul-487
PCT-19	CA-Tul-485
PCT-20	CA-Tul-488
PCT-21	CA-Tul-489

Bear Mountain Segment

KR-39	CA-Tul-629
KR-41	CA-Tul-621
KR-42	CA-Tul-620
KR-43	CA-Tul-619
KR-44	CA-Tul-618
KR-46	CA-Tul-630
KR-49	CA-Tul-628
KR-50	CA-Tul-616
KR-53	CA-Tul-767
KR-57	CA-Tul-636
KR-60	CA-Tul-625
KR-64	CA-Tul-623
KR-48	CA-Tul-617
KR-71	CA-Tul-634
KR-73	CA-Tul-632